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Robert T. Burrus, Jr. and J. Edward Graham, Jr.
University of North Carolina Wilmington

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Asset Pricing and Foreign Exchange Risk

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Abstract

The goal of this study is to re-examine the relationship between stock returns and foreign exchange risk. The novelties of this work are: a) a data set that makes use of daily observations for the measurement of the foreign exchange exposure and volatility of the sample firms and b) data from a Eurozone country. The empirical findings show that the foreign exchange risk is priced in the cross section of the German stock returns over the period 2000 to 2008. Furthermore, we show that the relationship between returns and foreign exchange sensitivity is nonlinear, but it takes an inverse U-shape and that foreign exchange sensitivity is larger in small size firms and value stocks.

Objectives

The research area around asset pricing has undoubtedly been one of the most important and at the same time challenging fields within financial economics. Since the second half of the last century, more and more academics across the world have been dealing with the detection of risk factors which capture the cross – section of average stock returns. The objectives of these attempts focus on the identification of the variables which proxy for common risk factors, the theoretical foundation of the relation between potential risk factors and stock returns, and the modeling of the systematic risk using econometric methods.

The main objective of this paper is to provide evidence of whether the foreign exchange risk is an asset pricing factor by exploring the effect that a foreign exchange mimicking factor portfolio has in explaining the cross sectional variation of stock returns. The methodology we use is based on the work by Fama and French (1993), Carhart (1997) and Kolari et. al. (2008) forming the size, the market-to-book equity ratio, momentum and foreign exchange mimicking factor portfolios as to explain the returns of the sample stocks.

The novelties of this work are the extension of the asset pricing tests by the use of: a) a data set from the Eurozone contributing by this way the necessary accumulation of non-US research and b) daily observations for the measurement of the foreign exchange exposure of the sample firms and the size, value, momentum and foreign exchange, mimicking factor portfolios as opposed to the majority of the literature that uses monthly observations.

The present study uses the time–series regression approach of Black et. al. (1972). However, instead of using monthly excess returns, daily excess returns, of the sample stocks regressed to a market portfolio and mimicking portfolios for size, BE/ME, momentum and foreign exchange risk factors are used. According to Fama and French (1993), the time–series regression coefficients are factor loadings that have a clear interpretation as risk–factor sensitivities for stocks. The time–series regressions approach, in contrast to cross–section regressions, gives us the chance to answer two important asset pricing questions: i) whether the mimicking portfolio related to the foreign exchange risk captures shared variation in stock returns, not explained by other factors and ii) whether the research model is a well – specified or parsimonious asset pricing model, producing intercepts not statistical significant or indistinguishable from zero [Merton (1973)].

Data Description

The sample used in the empirical tests consists of all companies listed on the "Deutsche Börse" from 2000 to 2008. Stock prices, index market prices, market capitalization, accounting data of the sample firms and risk-free rates of return are sourced from the Bloomberg Professional Database. The number of sample firms ranges from 73 in 2000 to 468 in 2008, resulting in 656,000 daily observations.

All companies listed in year 2008 are included in the initial sample. Also, firms delisted from the "Deutsche Börse" each year between 2000 and 2008 are identified and consequently added to the initial sample. Companies that have changed name under the selected period are identified and treated as a single unit. Moreover, companies that either merged or are acquired over the study period are treated as a new unit following the event. By this way, a selection bias towards historically successful firms is limited to a great extent.

Listed companies, which have been under suspension for more than 50% of year t, are excluded from the final sample. Moreover, firms with no available financial information for book or market equity for at least twelve months in a row are not included in the sample either. Financial data is necessary for the construction of fundamental variables for the various portfolios of each year of the research period. Specifically, for each stock in the sample the book-to-market equity ratio (BE/ME) in June of each year t is calculated, which is the book value for common equity for fiscal year t–1 over the market equity of the stock at the end of December of year t–1. Following Fama and French (1992), we also exclude companies with negative BE/ME ratios at 12/31 of year t–1. Last but not least, stock prices are adjusted for dividends and stock splits.

Methodological Issues

The first step in the methodology involved the estimation of the sensitivity of each stock to exchange rate movements over time. The sensitivity of each stock to foreign exchange movements is defined as the correlation between stock returns and contemporaneous changes in the value of the Euro. Specifically, this is achieved by regressing each stock return on the foreign exchange return series (FX), which captures the return on the Euro per currency basket and simultaneously controlling for size, value and momentum effects:

$$(R_i-R_f)t = a_i + b_i\,(R_M-R_f)_t + s_i\,SMB_t + h_i\,HML_t + w_i\,WML_t + f_i\,FX_t + \varepsilon_i \qquad (1)$$

where,

a_i = intercept
$(R_i-R_f)_t$ = excess returns of individual stock i
R_i = log returns of stock i
R_f = log returns of the risk free asset
R_M = log returns of the stock market index
SMB_t = log returns on a mimicking portfolio that is long in small size stocks and short on big size stocks, thus capturing the size effect
HML_t = log returns on a mimicking portfolio that is long in high BE/ME ratio stocks and short on low BE/ME ratio stocks, thus capturing the value effect
WML_t = log returns on a mimicking portfolio that is long in winner stocks and short in loser stocks, thus capturing the momentum effect
FX_t = log returns of the Euro per currency basket
e_i = error term

As a market proxy the DAX German stock index is used, which is a blue chip stock market index consisting of the 30 major German companies trading on the Frankfurt Stock Exchange. The 12-month German Treasury-Bill is used as the risk-free rate of return.

To calculate the returns of the SMB, HML and WML risk factors, all stocks at the end of June of each year t from 2000 to 2008 are ranked on size (capitalization). The median capitalization is then used to allocate stocks into two groups: one group consisting of small capitalization firms and another group consisting of large capitalization firms. Then all stocks are ranked based on their book-to-market equity ratio on 12/31 of the previous year (BE_{t-1}/ME_{t-1}) and divided into three BE/ME groups. This way, 30% of stocks are allocated to the low BE/ME portfolio, 40% to the medium BE/ME portfolio and 30% to the high BE/ME portfolio. Finally, for all stocks in the sample, at the end of June of each year t, from 2000 to 2008, the average daily return of the previous year is also calculated. Then all stocks are ranked from the highest to the lowest average daily return and allocated into three momentum portfolios. The "winner" portfolio is defined as the top 30% stocks with the highest last year average return. The "loser" portfolio is defined as the bottom 30% stocks and the "medium" portfolio is defined as the middle 40% stocks. As a result, we form eighteen stock portfolios at the intersection of the two size, three BE/ME and three momentum deciles.

The SMB factor is a portfolio that is long on small sized stocks and short on big sized stocks and is neutral on the momentum and value effects. The monthly returns on the SMB factor are calculated as the difference between the average returns on the nine small size portfolios (SHW, SHM, SHL, SMW, SMM, SML, SLW, SLM, SLL) and the average returns on the nine big size portfolios (BHW, BHM, BHL, BMW, BMM, BML, BLW, BLM, BLL). The HML factor is a portfolio that is long on high BE/ME stocks and short on the low BE/ME stocks and is neutral on the momentum and size effects. The monthly returns on the HML factor are calculated as the difference between the average returns on the six high BE/ME portfolios (SHW, SHM, SHL, BHW, BHM, BHL) and the average returns on the six big size portfolios (SLW, SLM, SLL, BLW, BLM, BLL). The WML factor is a portfolio that is long on winner stocks and short on loser stocks and is neutral on the size and value effects. The monthly returns on the WML factor are calculated as the difference between the average returns on the six winner portfolios (SHW, SMW, SLW, BHW, BMW, BLW) and the average returns on the six loser portfolios (SHL, SML, SLL, BHL, BML, BLL). Finally, it must be noted that the portfolio construction procedure for the calculation of the risk factors returns is performed with annually rebalancing frequencies and the stocks within the portfolios are equally weighted.

We measure the return of the foreign exchange series (FX_t) using the effective exchange rate of the Euro, which is compiled by the ECB. It is based on weighted averages of bilateral Euro exchange rates against 21 major trading partners of the Euro area. The weights capture third-market effects and are based on trade in manufactured goods with the main trading partners of Euroland countries.

The Euro effective exchange rate index is set at a value of 100 at the first day (7/3/2000) of the research period. If the index goes up, more foreign currency can be obtained, on average, for €1. Therefore when the foreign exchange index goes up the Euro strengthens against the other currencies and it becomes more expensive, on average, for those who want to exchange foreign currency for Euro. By contrast, if this index rate goes down, the Euro weakens against foreign currency, less foreign currency can be obtained, on average, for €1 and, in turn, it becomes less expensive to exchange

foreign currency into Euro. As it can be seen in Figure 1, over the period under study the effective exchange rate of the Euro indicates an appreciation course, implying that in the majority of our cases, if not all, the coefficient f_i should turn out to be positive.

Equation (1) is estimated annually using daily data and one-year rolling periods beginning in July each year. For example, we first estimate Equation (1) for each firm during July 2000 to June 2001 and obtain firm-specific values of the f_i coefficients for 2000. We repeat the procedure for the period from July 2001 to June 2002 to obtain firm-specific f_i coefficients for 2001, and thereafter continue the process until 2008.

After obtaining annual measures of firm-specific foreign exchange exposure f_i from Equation 1, we rank firms based on the value of these coefficients into 10 portfolios. We then compute a cross-sectional total of the returns within each of the 10 portfolios during the following year (i.e., July 2000 to June 2001 for the first run, July 2001 to June 2002 for the second and so forth). Finally, for each portfolio rank (1,2,.,10), we compute an intertemporal average of the annual portfolio returns. For example, we take all annual total returns associated with the portfolio ranked number 10 (firms with the most positive exposure to foreign exchange risk) and compute another average across time periods (by averaging the average returns from 2000 to 2008). We repeat the procedure for the remaining 9 portfolios. Portfolios 1 and 10 consist of stocks with the highest absolute (positive or negative) foreign exchange exposure. Finally, we calculate the return of the hedge (zero-investment) portfolio as the value weighted daily return of stocks in portfolios 2 through 9 minus stocks in portfolios 1 and 10.

The second part of the methodology, in line with the work of Kolari et. al. (2008), involves the construction of a foreign exchange risk factor in such manner as to obtain a monotonic relation between risk and expected returns. We do this by creating a zero-investment portfolio that takes long positions in stocks that have the extreme negative or positive sensitivity to foreign exchange risk (portfolios ranked 1 and 10) and short positions in all other stocks (portfolios ranked 2 through 9).

We refer to this factor as SFXI (sensitive foreign exchange minus insensitive). If SFXI is a priced factor, it should reduce the mean pricing error (absolute value of the intercept) of the other pricing models examined (i.e. two factor, three-factor, and four-factor). To test this assertion, we first regress the excess returns of each of the 10 sensitivity based portfolios against factors from three different models: i) a one-factor model containing the market risk premium, ii) a Fama-French three-factor model and iii) a Fama- French-Carhart four factor model:

$$(R_i-R_f)_t = a_i + b_i\,(R_M-R_f)_t + \varepsilon_i \qquad (3)$$
$$(R_i-R_f)_t = a_i + b_i\,(R_M-R_f)_t + s_i\,SMB_t + h_i\,HML_t + \varepsilon_i \qquad (4)$$
$$(R_i-R_f)_t = a_i + b_i\,(R_M-R_f)_t + s_i\,SMB_t + h_i\,HML_t + w_i\,WML_t + \varepsilon_i \qquad (5)$$

where,

$(R_i-R_f)_t$ = excess returns of each of the 10 sensitivity based portfolios
R_f = log return of the risk free asset
RM = log returns of the stock market index
SMB_t = log returns of the size mimicking portfolio
HML_t = log returns of the value mimicking portfolio
WML_t = log returns of the momentum mimicking portfolio
e_i = error term

We then repeat the analysis using the above pricing models that include SFXI and recalculate the monthly intercepts for the 10 foreign exchange-sensitivity portfolios:

$$(R_i-R_f)_t = a_i + b_i\,(R_M-R_f)_t + f_i\,SFXI_t + \varepsilon_i \qquad (6)$$
$$(R_i-R_f)_t = a_i + b_i\,(R_M-R_f)_t + s_i\,SMB_t + h_i\,HML_t + f_i\,SFXI_t + \varepsilon_i \qquad (7)$$
$$(R_i-R_f)_t = a_i + b_i\,(R_M-R_f)_t + s_i\,SMB_t + h_i\,HML_t + w_i\,WML_t + f_i\,SFXI_t + \varepsilon_i \qquad (8)$$

where,

$(R_i-Rf)_t$ = excess returns of each of the 10 sensitivity based portfolios
R_f = log returns of the risk free asset
R_M = log returns of the stock market index
SMB_t = log returns of the size mimicking portfolio
HML_t = log returns of the value mimicking portfolio
WML_t = log returns of the momentum mimicking portfolio
$SFXI_t$ = log returns of the foreign exchange pricing factor
e_i = error term

Empirical Results

Prior to the first step of the methodological approach, unit root tests for the Effective Exchange Rate of the Euro were implemented that showed that the level of the index contains a unit root, i.e. it is not stationary, while its first differences display the absence of unit roots (the results are available upon request), implying the ΔFX variable is stationary. Moreover, we do not need to implement unit root tests for the remaining variables: excess returns of sample stocks, market excess return, SMB, HML, WML, SFXI. They are stationary by construction.

Next, the first step of the methodology involves the ranking of the sample firms, based on the value of the foreign exchange exposure (f_i), into 10 portfolios and the computation of the average annual portfolio returns. Companies with the highest negative exposure are ranked in portfolio 1, while companies with the highest positive exposure are ranked in portfolio 10. The foreign exchange sensitivity exposure coefficient shows how the daily excess return of a stock is expected to move when the effective exchange rate of the euro index rises by 1%.

A positive foreign exchange coefficient exposure means that as the effective exchange rate index rises, i.e. as the Euro strengthens against the currencies basket, the daily price performance of the sample companies also rises. German importing companies are required to pay a smaller amount of Euros for a certain amount of foreign currency when the Euro exchange rate rises against other currencies, i.e. they are positively affected when the Euro strengthens. Thus, companies in portfolios 6 through 10, which have a positive foreign exchange coefficient, appear to be mainly exporters. On the other hand the price performance of companies in portfolios 1 through 10, which have a negative foreign exchange sensitivity coefficient, increases when the Euro effective exchange rate index falls. German exporting companies will receive more Euros for a certain amount of foreign currency, and will be positively affected, when the Euro weakens against other currencies. Thus, companies in portfolios 1 through 5 appear to be exporters.

The results reveal that portfolios with the highest absolute foreign exchange exposure (1 and 10) exhibit the lowest average raw returns. Specifically, portfolios 1 and 10 have -53.60% and -41.79% average raw returns respectively, while all other portfolios have quite larger returns, ranging from -15.04% to -32.32%. Moreover, we provide evidence that the relationship between returns and foreign exchange sensitivity is nonlinear, as many would expect, but it takes an inverse U-shape, since the lowest returns are those of the extreme foreign exchange sensitivity portfolios and the highest are found in the middle not so sensitive portfolios.

Te smaller companies, in terms of market capitalization, are the ones that have the extreme foreign exchange sensitivity, either positive or negative, while the larger ones have the lowest foreign exchange sensitivity. This means that in the middle portfolios consisting of large cap companies there are either no importers or exporters or that these companies hedge effectively a large part of their foreign exchange exposure. The same pattern is also evidenced in the relationship between foreign exchange exposure and: a) book-to-market equity (BE/ME) ratio, and b) last year's return. The results show that value firms, the ones with larger BE/ME ratios, are the ones with a greater absolute foreign exchange exposure. In addition, the firms with a greater past year price performance exhibit lower foreign exchange sensitivity as opposed to the ones with a lower past year price performance. Finally, it must be noted that average raw returns of the combined portfolio, containing the most foreign exchange sensate stocks (1 and 10), is lower than those of the remaining portfolios by 23.48%.

We first regress the excess returns of each of the 10 sensitivity based portfolios against: (1) a one-factor model containing the market risk premium and (2) a two-factor model containing the market risk premium and the SFXI factor. This allows us to test for information content in the foreign exchange risk factor that is not contained already in the market risk premium.

The regression between excess return and market risk premium results in positive and statistical significant coefficients that range from 0.4 to 0.5 for all 10 foreign exchange sensitivity portfolios. Furthermore, the constant terms in most cases are non-negative and statistical significant. However, given the low values of the R^2, it appears that the market factor cannot explain alone the returns of the foreign exchange sensitivity portfolios. In addition, diagnostics regarding serial correlation as well as model specification support the absence of model misspecifications.

The empirical results of the bivariate model show that the factor loadings of the market risk premium remain relatively stable in terms of magnitude and significance as compared with the ones from the univariate model. The constants are statistically significant non zero in all of the cases. The coefficient of the foreign exchange risk factor is positive in nine out of ten portfolios with the highest statistical significant values obtained from the extreme foreign exchange sensitive portfolios. As a whole, the overall fit of the estimated equation, as measured by the coefficient of determination, is better than the one-factor model, indicating that the SFXI factor contains additional information. However, the adjusted coefficient of determination for all 10 portfolios ranges from 0.26 to 0.52. Thus, there is a great degree of variability in the average returns that is still not captured by the two-factor model.

The next step involves the regression of the excess returns of each of the 10 foreign exchange sensitivity based portfolios against: i) the Fama-French 3FM and ii) a 4FM containing the market risk premium, SMB and HML factors and the SFXI factor. The empirical results of the 3FM show that the coefficients of all 10 foreign exchange sensitivity portfolios are statistical significant. At the same time, the constants are non-zero and non-statistical significant in the majority of the cases. The coefficients of the SMB factor are positive for all cases, ranging from 0.129 to 0.481, revealing a positive relationship between the returns of the foreign exchange sensitivity portfolios and the size risk factor.

Furthermore, it should be noted that the coefficients of the SMB factor exhibit two of their largest values at portfolios 1 and 10. Thus, the size premium is larger for portfolios of firms with high absolute foreign exchange sensitivity. This means that the SMB portfolio interprets an important part of the variation in the average return of shares and it represents a potential risk factor in stock returns, which it is linked to the foreign exchange exposure of companies.

Turning to the value factor, the results show a negative relationship between the foreign exchange sensitivity portfolios and the HML mimicking portfolio. The findings, as far as the adjusted coefficients of determination are concerned, are quite interesting. The 3FM exhibits a quite strong explanatory power as compared to the one-factor model, since the coefficient of determination is greater in the majority of the cases.

The factor loadings of the three Fama-French factors remain quite stable as far as their sign is regarded with only some small variations in their magnitude. Furthermore, an increase in the adjusted coefficient of determination is detected, implying that additional information is contained in the risk factors SMB, HML, SFXI and that neither of them or the market risk premium should be omitted. However, the factor coefficients have relative medium magnitude, indicating that they add only a portion to the return of the dependent factor.

The final step involves the regression of the excess returns of each of the 10 foreign exchange sensitivity based portfolios against: i) the Fama-French-Carhart 4FM model and ii) a 5FM containing the market risk premium, SMB, HML, WML factors plus the SFXI factor. The signs and magnitude of the market risk premium, SMB and HML remained quite stable as compared to the Fama-French regressions for all ten portfolios. The addition of the momentum factor (WML) added a small degree of incremental information in the cases of portfolios 3, 5 and 8 as it can be seen by the adjusted coefficients of determination. However, there is no clear pattern in the factor loading of the WML, since it ranges from a negative value of -0.364 to a positive value of 0.971.

The step-wise regression methodology provides insights on the incremental power contained in each independent factor. Focusing on the factor loadings, we can see that they remain relatively stable in terms of sign, magnitude and statistical significance in the case of the market risk premium, the size and the value factor. However, this in not the case for the momentum factor, which changes signs from to positive to negative and is statistical significant only in a number of cases. However, the most interesting point in the results of the final regression model is the increased R^2, revealing that the inclusion of the foreign exchange risk factor, along with the other risk factors, results in a considerable enhanced explanatory power of the model.

The constant term in the five factor model is statistically significant in some of the regressions. The implication of this finding is that the dependent variable, the performance of portfolios, will exhibit abnormal returns, which cannot be explained by the 5FM. According to Merton (1973), a multifactor equilibrium model can be though of as a parsimonious asset pricing model only when the constant term is either equal to zero or statistically insignificant. Thus, the inclusion of the foreign exchange risk factor, though it enhances the predictability of the model, it does not appear to explain fully the variability of stocks returns.

An alternative method for interpreting the intercepts of the regression models is by employing the Gibbons et. al. (1989) GRS statistic to test the hypothesis Ho: $a_i = 0 \ \forall$ i, or simply to test the intercepts jointly. The GRS test is performed by running all 6 regression models and computing the intercepts or alphas and then testing whether the alphas are jointly zero. As the estimates of intercepts increase in absolute value, so will the value of the GRS statistic. The equation for the GRS test is presented below:

$$\text{GRS statistic} = \frac{(T)}{(N)} \frac{(T-N-k)}{(T-k-1)} (1+\mu_\kappa' \Omega^{-1} \mu_\kappa)^{-1} (\hat{a}' \hat{S}^{-1} \hat{a}) \qquad (9)$$

where:

T	=	number of observations
N	=	number of dependent variables
k	=	number of explanatory variables in the regression
$\hat{a}$	=	N x 1 vector of estimated intercepts
$\hat{S}$	=	unbiased estimates of the residual covariance matrix
μ_κ	=	k x 1 vector of the factor portfolios' means
Ω	=	unbiased estimates of the factor portfolios' covariance matrix

A larger value of the GRS statistic indicates that intercepts are jointly different from zero and by extension the factors of the model cannot adequately explain the variation of returns for a portfolio. A small p-value indicates that we can reject the null that Ho: $a_i = 0$ for all i's. From the comparison of the 6 empirical models it is evident that the model that best describes the cross-section of German stock returns is the model which has as explanatory variables the Fama-French risk factors plus the foreign exchange risk factor. In any case, when the foreign exchange risk factor is added as an explanatory power, then the predictive power of the model increases as it is indicated by the lower GRS statistic.

Conclusions, Policy Implications and Suggestions for Further Research

The main objective of the present paper was to provide evidence of whether the foreign exchange risk is an asset pricing factor by exploring the effect that a foreign exchange mimicking factor portfolio has in explaining the cross sectional variation of stock returns. The empirical findings showed that foreign exchange risk is priced in the cross-section of the German stock returns.

The first step in the methodology involved the estimation of the sensitivity of each stock to exchange rate movements and the allocation of the sample stocks into foreign exchange sensitivity portfolios. It was shown that the relationship between returns and foreign exchange sensitivity is nonlinear, but it takes an inverse U-shape, confirming the findings of Kolari et. al. (2008). Stocks with absolute foreign exchange sensitivity, either positive or negative, have the lower returns as compared to other firms with lower foreign exchange sensitivity. In other words, as opposed to what would be expected from a classical asset pricing model, the evidence showed that investors require a lower expected return from either exporters or importers that do not hedge their foreign exchange position.

The implications of this finding are twofold. First, the evidence showed that investors are primarily concerned about the magnitude of the foreign exchange exposure and secondly about the sign. Second, it imposes serious implications for the valuation of these firms from stock analysts and investors in general, since the expected return is an important input in the valuation of companies with lower expected returns resulting in higher intrinsic values.

Furthermore, it was shown that the foreign exchange sensitivity is larger in small size firms than in large capitalization stocks and that value stocks with high book-to-market equity ratios have larger foreign exchange coefficients. Thus, further research in the area of foreign exchange risk exposure should focus on small capitalization stocks with high book-to-market equity ratios. Investors should keep in mind that small size importers and exporters appear not to hedge their foreign exchange position, thus, resulting in the assumption of higher risk levels.

The third part of the methodology involved the construction of a foreign exchange risk mimicking portfolio to examine if it captures better the cross section of stock returns. In doing so, we employed a step-wise regression methodology to observe the change in the explanatory power of the independent variables and in the explanatory power of the asset pricing models.

The evidence showed that the factor loadings remained relatively stable in terms of sign, magnitude and statistical significance across the three asset pricing models in the case of the market risk premium, size and the value factor. However, this is not the case for the momentum factor were we failed to find a clear and robust pattern, since it changed signs from to positive to negative. Specifically, as expected, a positive statistical significant relationship between stock returns and the market risk premium and the size factor was documented, while this relationship was negative for the value factor. However, the most interesting point of the results was the increased R^2 figures we obtained whenever the foreign exchange risk factor was explicitly included in the models. Thus, expect from the size and value factor investors must also take into account the foreign exchange risk as an important asset pricing factor when estimating the required rate of return of a company. Furthermore, the foreign exchange risk factor should be taken into account when financial analysts evaluate and attribute the performance of professionally managed portfolios.

It is evident that the foreign exchange risk is priced in the cross section of the German stock returns during the period 2000 to 2008. In order to further investigate and validate the pricing of the foreign exchange risk it is suggested that the same methodology should be used with data from other Eurozone countries. In doing so, one could make inferences on the degree of stock market integration among Eurozone countries. If the integration in European stock markets exists, then asset pricing models, including the five risk factors (market, size, value, momentum and foreign exchange), should generate virtually the same results across stock markets.

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Bankruptcy Probability and Stock Prices: The Effect of ALTMAN Z-Score Information on Stock Prices: Evidence from Panel Data.

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Abstract

Altman's Z-score model is one of the most commonly used tools for evaluating the financial health of companies and for calculating the probability of bankruptcy. There is an extensive branch of literature that examines the success of Altman's Z-score in predicting bankruptcy or financial distress, while the Altman's Z score has been extensively used in finance and accounting research as a (dependent, proxy or control, dummy) variable in models that accommodate bankruptcy or financial distress. The goal of this research paper is to investigate the stock price performance of firms that exhibit a large probability of bankruptcy according to the model of Altman. The problem is that to compute the Altman's Z score, the researcher should use stock prices. Regardless of the validity of Altman's Z score, we utilize a new design that relates stock price movements to Altman's Z score. We focus and examine, through the methodology of panel data, whether stocks that have a high probability of bankruptcy underperform stocks with a low probability of bankruptcy or if there are differences in the way the markets react to the financial health of the sample firms.

Introduction

The main goal of accounting and financial analysis is to provide all interesting parties with information concerning the financial health of a firm. Amongst the interesting parties are investors who whish to value the company based on the information provided by analysts. One of the parameters that investors should take into consideration is the estimation of the probability of bankruptcy of the firm. A number of models have been developed that calculate this probability, but the one that is most commonly used in practise is that of the Altman Z-score[i]. The model, developed by Altman (1968), utilizes five ratios that are combined and analyzed with the use of discriminant analysis. In doing so, a linear model is developed, whereby the ratios are weighted to maximize the model's bankruptcy predictive power and a score is given that implies the firm's financial strength.

In relation to bankruptcy prediction models, two main research directions have been followed by researchers in accounting and finance literature. In the first branch of research, a number of studies have examined the predictive power of various bankruptcy models. Two broad categories of predictive models exist, that is predictive models that are based on accounting data (i.e. Altman (1968) model or the Ohlson (1980) model) and predictive models that derive bankruptcy probabilities based on option pricing models that utilize market data (i.e. Hillegeist, Keating, Cram and Lundstedt, 2004, Agarwal and Taffler, 2007).

In the second branch of research, various measures of default probabilities are tested for their relation with market variables. The main research idea driving the second branch of research is that scores derived from bankruptcy models are related to the firm's systematic risk that is incorporated in the firm's market capitalization. Therefore, the main hypothesis is that firms with a high score in terms of bankruptcy risk are expected to provide shareholders with greater returns to compensate for the high risk.

Altman and Brenner (1981) examine the presence of abnormal returns for a number of companies to provide evidence regarding the stock price reaction of 'new' information as measured by the change in the Altman Z score. Dichev (1998), initially, reports negative correlation coefficients between Altman Z score and realized returns consistent with the above hypothesis. However, his subsequent regression[ii] and portfolio analysis tests do not provide strong evidence of the relationship between bankruptcy risk as captured by Altman Z score and market returns. Piotroski (2000) also reports higher market returns for firms with low levels of financial distress (measured by Altman Z score) than firms with high levels of financial distress.

A negative relationship between default probabilities and market returns is also reported by Campbell et al. (2004) and Griffin and Lemmon (2002). In contrast, Vassalou and Xing (2004) conclude that their measure of default risk positively influences market capitalization and high default risk firms earn higher returns if it is a small size firm with a high book to market ratio. Results from Garlappi et al. (2008) imply that variation in firms' market returns with high default probability is explained by the shareholders bargaining power in negotiating debt and, holding other information constant, firms with lower bargaining power earn higher returns than firms with higher bargaining power.

In testing the information content of SAS no 59[iii] and evaluating its usefulness in mitigating bankruptcy surprises as captured by market reaction, Holder-Webb and Wilkins (2000) report a positive[iv] relationship between the Altman Z[v] score and excess returns around the bankruptcy announcement.

In this study we attempt to address the effect of Altman Z score on stock variables under panel data methodology and to provide empirical results related to the causal relationship between Altman Z score and stock prices. The remaining of our study is organised as follows; in the following section we present our main variables of interest, then we analyse our empirical results and, finally, we conclude.

Sample and Variables

The focus of our empirical analysis is on the relationship between the Altman Z-score and stock prices for a certain number of listed companies. The sample includes listed companies from the stock exchange (thereafter SE) of Paris, the SE of London and the SE of Frankfurt, while our data covers the period from 2003 to 2009.

The variables used in our research analysis are stock prices (SP), net income (NI), Book Value (BV), number of shares (NS), Working Capital (WC), Total Assets (TA), Retained Earnings (RE), Earnings before Interest and Taxes (EBITDA), Market Value of Equity (CAP), Total Liabilities (TL) and Sales (S). Annual (at the end of each of each fiscal year) data is collected from Bloomberg database and in the case a firm has missing values for any of the research variables in any year it is dropped from the sample. As a result, the sample includes 279 firms from the London SE, 200 firms from the Frankfurt SE and 200 firms from the Paris SE. For the empirical goals of the analysis, the Altman Z-score is calculated as:

$Z = 1.2\,T_1 + 1.4\,T_2 + 3.3\,T_3 + 0.6\,T_4 + 0.999\,T_5$

where:

T_1 = Working Capital / Total Assets, T_2 = Retained Earnings / Total Assets, T_3 = Earnings before Interest and Taxes / Total Assets, T_4 = Market Value of Equity / Book Value of Total Liabilities, T_5 = Sales / Total Assets. The price earnings ratio and the price to book value ratio are calculated as follows:

PE = NI / NS and PBV = BV / NS

Empirical results

In the empirical results' section we initially attempt to address the issue of stationarity and cointegration, then we apply suitable regression techniques in order to test the effect of Z score on SP and finally we test for the causality among variables of interest.

Panel Integration and Cointegration Analysis

The research model (model 1) used for our empirical analysis provides results related to the effect of Z on SP after controlling for other variables of interest such as PE, PBV and CAP[vi] and it is depicted as follows:

$SP_{it} = Z_{it} + PE_{it} + PBV_{it} + CAP_{it}$ (Model 1)

Table 1: Panel Unit root tests

Variables	Levels	1st differences	Levels	1st differences
	London		Paris Euro Next	
Z	0.38(4)□□	5.27(3)*	0.38(4)	5.27(3)*
PE	0.74(3)	9.03(2)*	0.74(3)	9.03(2)*
PBV	0.68(5)	7.35(3)*	0.68(5)	7.35(3)*
CAP	0.81(5)	7.55(4)*	0.81(5)	7.55(4)*
SP	0.49(4)	8.02(3)*	0.49(4)	8.02(3)*
	Frankfurt		All♣	
Z	-0.69(5)	-5.32(4)*	0.73(5)	6.21(4)*
PE	-0.68(4)	-7.12(3)*	1.23(6)	7.07(3)*
PBV	-0.95(4)	-7.45(2)*	0.65(4)	7.31(3)*
CAP	-0.26(4)	-5.56(1)*	0.91(5)	6.13(4)*
SP	-0.72(5)	-9.45(4)*	1.22(5)	7.91(3)*

Notes to Table 1

□ : Figures in brackets denote the number of lags in the augmented term that ensures white-noise residuals. The optimal lag length was determined through the Akaike information Criterion (AIC) and the Schwarz-Bayes Information Criterion (SBIC).

♣: All refers to all observations from the London Stock Exchange, Frankfurt Stock Exchange and Paris Stock Exchange.

*: significant at 1%.

In Table 1 we report results from tests of the null hypothesis of nonstationarity (with a trend). We use the group mean panel unit root test (or 't-bar' test) of Im, *et al.* (1995) that allows under the alternative hypothesis each member of the cross section to have a different autoregressive root and different autocorrelation structures. The t-bar statistic is based on the Augmented Dickey-Fuller (ADF) statistic (Dickey and Fuller, 1981). Using the level formulation, our results suggest

the variables SP, Z, PE, PBV and CAP contain a unit root as the hypothesis that the aforementioned variables contain a unit root is not rejected (at 1% level). Tests based on the first difference formulation imply that variables are integrated of order 1 (i.e. I(1)) because unit root nonstationarity is rejected (1% level). Results from Table 1 show that these properties of our data are valid for both the whole sample of observations and for tests that used observations from each stock exchange.

Following results from Table 1, we move to a panel cointegration approach, which uses a residual-based ADF test, developed by Pedroni (1999). In Table 2 empirical results of the null hypothesis of no cointegration are reported for the whole sample of observations and for each stock exchange separately. The specific cointegrating relationship estimated is:

$$SP = \beta_{0i} + \beta_{1i} Z_{it} + \beta_{2i} PE_{it} + \beta_{3i} PBV_{it} + \beta_{4i} CAP_{it\,t} + \varepsilon 1_{it} \quad (1)$$

where i = 1 ... N companies and t = 1 ... T year observations. The term $\varepsilon 1_{it}$ is the deviations from the modeled long-run relationship. If the series are cointegrated, this term should be a stationary variable. Thus, stationarity is achieved by establishing whether $\rho 1_i$ in:

$$\varepsilon 1_{it} = \rho 1_i \varepsilon 1_{i(t-1)} + \xi 1_{it} \quad (2)$$

is unity. Our empirical results reject the null hypothesis (that is $\rho_i = 1$, in Pedroni's, 1999, statistical procedure) of no cointegration (at 1% significance level), suggesting that, in all empirical settings we are testing for, the panel is stationary.

Table 2: Panel Cointegration Tests

	All♣	London	Frankfurt	Paris Euro-next
Panel v-stat	46.88124*	40.26770*	45.09538*	55.44013*
Panel rho-stat	53.48499*	49.82439*	45.01094*	59.02585*
Panel pp-stat	65.87408*	61.33720*	47.72110*	55.90046*
Panel adf-stat	8.08547*	6.29326*	7.48183*	7.31977*
Group rho-stat	59.87812*	49.46931*	41.63015*	51.88488*
Group pp-stat	63.02146*	50.55332*	40.52471*	51.12773*
Group adf-stat	7.44532*	7.39852*	6.88845*	9.50406*

Notes to Table 2:
*: Rejection of the null hypothesis of no cointegration at 1%.
♣: All refers to all observations from the London Stock Exchange, Frankfurt Stock Exchange and Paris Stock Exchange.

Empirical Results from Dynamic OLS

We empirically estimate the long-run relationship suggested by model 1 through the Dynamic OLS (DOLS) approach (Stock and Watson, 1993), considering, however, cointegration for the total amount of variables. Therefore, we empirically estimate results based on regressing SP on other independent variables plus lags and leads of the first-differences of independent variables. In Table 3[vii] we report empirical results for the whole sample of observation (denoted as **All** in Table 3) and for the three sub-samples from the corresponding stock exchanges.

Table 3: Dynamic OLS estimations of the effect of Altman Z score and other variables on SP

	All♣	London	Frankfurt	Paris Euro-next
Z	**0.207** □ (7.97)*	**0.5523** (59.51)*	**0.33** (23.89)*	**0.54** (12.07)*
PE	**0.142** (18.47)*	**0.421** (81.9)*	**0.23** (10.88)*	**0.244** (16.01)*
PBV	**0.251** (40,87)*	**0.5349** (50.54)*	**0.608** (10.48)*	**0.336** (11.38)*
CAP	**0.036** (40,43)	**0.17** (35.52)	**0.12** (19.31)	**0.011** (18.01)
R^2	0.71	0.72	0.64	0.59
$F\sigma^2_y$	95.46[0.00]	78.94[0.00].	77.52[0.00]	102.95[0.00]

Notes to Table 3:
♣: All refers to all observations from the London Stock Exchange, Frankfurt Stock Exchange and Paris Stock Exchange.
□ : Figures in parentheses denote t-statistics, while those in brackets p-values. R^2 denotes the adjusted R^2, while the F denotes the F statistic of test for the significance of all coefficients. Standard errors are computed through an adjustment suggested by Newey and West (1987)
*: significant at 1%.

The DOLS estimations include (non-tabulated) companies-specific constants. For the **whole** sample, the F-test indicates that the coefficients are jointly significant across companies. The positive (0,207) and significant coefficient[viii] attached to **Altman Z** score implies that firms with lower financial strength (low Z) have lower stock prices consistent with a lower capitalization factor (i.e. cost of capital). Qualitatively similar results are reported for the coefficient

attached to Altman Z score for the **sub-samples** of observations from the SE of London (0,5523), the SE of Frankfurt (0,33) and the SE of Paris Euro-next (0,54). Moreover, positive and significant coefficients are reported for the **PE** variable and the **PBV** variable for the whole sample and the corresponding three sub-samples. In contrast, the coefficient estimate attached to CAP is positive but statistically insignificant for all empirical tests.

Panel Causality

In order to provide empirical results related to causal relationships (for panel data) between Z score and SP and given cointegration, we utilize the Pooled Mean Group (PMG) estimator of Pesaran et al. (1999). Using an error correction VAR (ECVAR) model, we examine the causal link and the direction of the association for our research model as follows (only the SP and Z equations are reported, while the remaining equations are available upon request):

Considering that the cointegrating equation is:

$$SP_{it} = \theta_{0i} + \theta_{1i} ZI_{it} + \theta_{2i} PE_{it} + \theta_{3i} PBV_{it} + \theta_{4i} CUP_{it} + u_{it} \quad (3)$$

and the associated ARDL equations are described by a (1,1,1,1) model:

$$SP_{it} = \mu_i + \delta_{10i} Z_{it} + \delta_{11i} Z_{i,t-1} + \delta_{12i} PE_{it} + \delta_{13i} PE_{i,t-1} + \delta_{14i} PBV_{it} + \delta_{15i} PBV_{i,t-1} + \delta_{16i} CAP_{it} + \delta_{17i} CAP_{i,t-1} + \delta_{18i} SP_{i,t-1} + \delta_{19i} Z_{i,t+1} + \delta_{20i} PE_{i,t+1} + \delta_{21i} PBV_{i,t+1} + \delta_{22i} CAP_{i,t+1} + \varepsilon 1_{it} \quad (4)$$

and

$$Z_{it} = \mu_i + \delta_{20i} SP_{it} + \delta_{21i} SP_{i,t-1} + \delta_{22i} PE_{it} + \delta_{23i} PE_{i,t-1} + \delta_{24i} PBV_{it} + \delta_{25i} PBV_{i,t-1} + \delta_{26i} CAP_{it} + \delta_{27i} CAP_{i,t-1} + \delta_{28i} Z_{i,t-1} + \delta_{29i} SP_{i,t+1} + \delta_{30i} PE_{i,t+1} + \delta_{31i} PBV_{i,t+1} + \delta_{33i} CAP_{i,t+1} + \varepsilon 2_{it} \quad (5)$$

the error correction equations yield:

$$\Delta SP_{it} = \varphi (SP_{i,t} - \theta_{0i} - \theta_{1i} Z_{it} - \theta_{2i} PE_{it} - \theta_{3i} PBV_{it} - \theta_{4i} CAP_{it}) - \delta_{30i} \Delta Z_{it} - \delta_{40i} \Delta PE_{it} - \delta_{50i} \Delta PBV_{it} - \delta_{60i} \Delta CAP_{it} + \varepsilon 3_{it} \quad (6)$$

and

$$\Delta Z_{it} = \varphi (Z_{i,t} - \theta_{0i} - \theta_{1i} SP_{it} - \theta_{2i} PE_{it} - \theta_{3i} PBV_{it} - \theta_{4i} CAP_{it}) - \delta_{60i} \Delta SP_{it} - \delta_{70i} \Delta PE_{it} - \delta_{80i} \Delta PBV_{it} - \delta 9_{0i} \Delta CAP_{it} + \varepsilon 4_{it} \quad (7)$$

$\Delta Z \rightarrow r$ φ coefficient = - 0.181, asymptotic t-statistic: -21.99*
$r \rightarrow \Delta Z$ φ coefficient = - 0.174, asymptotic t-statistic: -7.15*

with r indicating change in price (ΔSP), that is stock returns. For the whole sample (the respective **all** sample in Table 3), the error-correction coefficients (φs) are statistically significant and negative (indicating mean reversion) implying that both Z-scores cause stock returns (with a coefficient estimate of - 0.181) and stock returns cause Z-scores (with a coefficient estimate of - 0.174). Further classification of the whole sample to sub-samples according to the stock exchange in which a firm is listed yields qualitatively similar results. The coefficient estimates (φ) attached to empirical models (6) and (7) are negative and statistically significant for the SE of London, the SE of Frankfurt and the SE of Paris Euro-next. The Altman Z-score is shown to be a significant determinant of stock returns, while stock returns is also a significant determinant in attracting Z in all companies and in all three stock exchanges. In particular:

London SE
$\Delta Z \rightarrow r$ φ coefficient = - 0.22, asymptotic t-statistic: -15.29*
$r \rightarrow \Delta Z$ φ coefficient = - 0.44, asymptotic t-statistic: -10.30*
Frankfurt SE
$\Delta Z \rightarrow r$ φ coefficient = - 0.18, asymptotic t-statistic: -11.62*
$r \rightarrow \Delta Z$ φ coefficient = - 0.76, asymptotic t-statistic: -9.45*
Paris SE
$\Delta Z \rightarrow r$ φ coefficient = - 0.22, asymptotic t-statistic: -16.41*
$r \rightarrow \Delta Z$ φ coefficient = - 0.56, asymptotic t-statistic: -12.48*

Conclusions

This research study showed that there is positive cross correlation between the Altman Z-score and the firm stock price. In firms in which the indicator of bankruptcy is lower, empirical results suggest that stock prices are lower. By contrast, when the indicator of bankruptcy is improved, stock prices follow an ascending course. The empirical findings imply that investors take seriously into consideration economic information that is related to the economic situation of firms in which they invest. The most important empirical finding is that causality runs form both stock prices to Altman Z score and vice-versa. However, we should note that our empirical research focuses on mature stock markets within a time period of relative calm in stock exchanges. This suggests that our empirical results might not hold for periods of economic growth in which stock prices might rapidly increase causing extreme positive stock returns. That happens mostly in emerging markets and for that reason it is suggested to research the relations of stock prices and basic accounting and financial ratios i) in periods of abnormal stock returns and ii) in both developed and emerging stock exchange markets.

Notes

[i] Z score is a measure of financial strength and a low magnitude of Z score implies low financial strength.

[ii] In the research design utilized by Dichev (1998), firm' market return is regressed on the Altman Z score, market to book ratio and the market value of the firm. The last two variables play the role of control variables.

[iii] Statement of Auditing Standard 59 refers to the auditors requirement to evaluate and report over firm's going concern status

[iv] In their model Altman Z score is multiplied by – 1 and a negative relation is reported

[v] In their model, the Altman Z score is used to control for the fact that investors have already perceived the higher default probability, while the main hypotheses tested are related to the clean audit opinion and the introduction of SAS 59.

[vi] CAP is used as a proxy for size.

[vii] Coefficient estimates (and corresponding p value and t-statisic) attached to lags and leads of the first differences of independent variables of Model 1 are not tabulated and are available upon request.

[viii] We compute robust standard errors through an adjustment suggested by Newey and West (1987).

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The Incidence of Cardiovascular Death and Stock Market Volatility

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Abstract

The National Morbidity, Mortality, and Air Pollution Study (NMMAPS) database has been used to determine the impact of air pollution on cardiovascular deaths. Using the NMMAPS data and a GARCH model of the daily return on the S&P 500, it is shown that for some age groups stock market volatility increases the incidence of cardiovascular death. Negative-binomial regressions are performed to test the relationship between daily cardiovascular deaths in 102 U.S. cities and the conditional variance of the S&P 500 returns. We find evidence that an increase in stock market volatility increases the number of heart attack deaths in certain age groups.

Introduction

As people approach retirement age it is natural that they pay closer attention to their retirement nest egg. Financial advisors routinely advise that as their clients become older they should shift a larger proportion of their portfolio out of stocks and into fixed income securities. This reduces their risk but also reduces their average return. Many people delay in making this shift in their portfolio in hopes of maximizing the size of their portfolio at the time of their retirement. As a result of this delay they become more sensitive to stock market volatility at a time in their lives when the likelihood of having a heart attack is also increasing.

Little research has been done about the impact of financial stress on mortality. David M. Cutler et al. (2002) studied the effect of the 1995-96 financial crisis in Mexico. They concluded that the mortality rate of elderly people increased by 0.4 percent during the crisis. Jahyeon Koo and W. Michael Cox (2008) find a relationship between unemployment rates and suicide rates in Japan.

In this paper, we will study the impact of stock market volatility on the cardiovascular death rate in 102 U.S. cities. The next three sections will discuss the data, the methods we employ to analyze that data, and our results. The final section states our conclusions and outlines future paths of research.

Data

We utilize the National Morbidity, Mortality, and Air Pollution Study (NMMAPS) dataset.[1] The data was collected as part of the Internet-based Health & Air Pollution Surveillance System (iHAPSS) developed and maintained by the Department of Biostatistics at the John Hopkins Bloomberg School of Public Health. The intended purpose of this dataset is to determine the effect of air pollution on daily mortality rates in 102 U.S. cities. The dataset includes daily observations starting January 2, 1987 and ending December 29, 2000. Deaths are identified as either non-accidental, cardiovascular (cvd), respiratory (resp), pneumonia (pneu), chronic obstructive pulmonary disease (copd), and accidental. Age at time of death is identified as less than 65, between 65 and 74, and greater than or equal to 75. Air pollution variables include PM10, PM2.5, CO, O3, SO2, and NO2. Weather variables include daily maximums, minimums, means, dew points, and relative humidity. This dataset is freely available on the internet. Roger Peng has constructed an R package which contains functions used to build a variety of datasets.

We extract the data from R and convert it to a Stata dataset. For each city we use the *loadCity()* command to bring up the data in R and then use the command *write.dta(*city, *file="*statafilename.dta*", convert.dates=TRUE)* to save the data to a Stata file. As an example, for New York City the R session would go as follows:

```
library(foreign)
library(NMMAPSdata)
loadCity("ny")
write.dta(ny, file="NMMAPSny.dta", convert.dates=TRUE).
```

These instructions assume that the NMMAPS dataset is already installed in R.[2] Once this was done for each city, we used Stata to merge the separate city files into one large dataset.

Our main concern is with respect to the impact of increased stock market volatility on the number of heart attack deaths in certain age groups. Increased market volatility creates uncertainty. Investors are often uncertain about the future of the stock market. At certain ages, the exposure to uncertainty or risk can make that specific population more prone to negative health outcomes.

In order to capture stock market volatility, the standard approach in the literature was to use measures of unconditional volatility obtained as the rolling variance of the squared returns. However there are concerns that such measures of volatility are inadequate. The main objection is that even if the measure captures the total variability of the series, part of that total variability is predictable. Thus, a variable may be very volatile, but for an economic agent, it may be predictable and possible to forecast. A second criticism of this measure is that the range of moving average (or rolling window) is specified in an ad-hoc manner by the researcher. To over-come these criticisms, more recently, the literature has shifted towards the use of ARCH and GARCH measures to model the concept of uncertainty. The ARCH/GARCH approach to estimating uncertainty is obtained on the basis of an estimated econometric model in which both the mean and variance equation can be estimated jointly. It is often observed that this method would capture volatility in each period more accurately.

ARCH and GARCH models are presumed to capture risk in each period more accurately because these models do not give equal weight to correlated shocks nor to single large outliers. They also allow us to capture several characteristics or stylized facts of the data (e.g. thick tails for the unconditional distribution, time varying variance, volatility clustering and serially uncorrelated movements). The ARCH model, proposed by Engle (1982) and generalized (GARCH) by Bollerslev (1986), characterizes the distribution of the stochastic error E_t conditional on the realized values of a set of variables that may include lagged values of the conditional variance.

We can consider a simple GARCH (p, q) process for y_t, which represents the percentage change in the S&P 500 (this is also known as the return on the S&P 500).

$$y_t = f(x_t \beta) + e_t \quad et/\psi_{t-1} \sim N(0, h_t^2) \qquad (1)$$

$$h_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i h_{t-i}^2, \qquad (2)$$

Where $f(x_t \beta)$ refers to the conditional mean, x_t is a vector of explanatory variables that may include lagged y_t's, β is a Mx1 vector of parameters, ψ_{t-1} is the information set that contains all the information available through time t-1, and e_t is the error term which follows, conditional on ψ_{t-1}, a normal distribution. The conditional errors have zero mean and time varying variance, h_t^2. The conditional variance follows a GARCH process as in (2). The GARCH variance h_t^2 is obtained and included in our data set as a proxy of stock market volatility/uncertainty.

We estimated the conditional variance using three alternative series of the S&P 500, the daily high, low, and closing values. Given the small magnitude of the resulting individual values, we scale each series by multiplying by 100,000 to make the coefficients easier to interpret.

The final dataset includes over 200 variables. We are concerned with the variables: *agecat, city, cityCode, date, cvd, tmpd, rhum, pm10trend, crash, garchclose2, garchlow2 and garchhigh2*. The variable *agecat* takes on the value of 1 if the age at death was less than 65, 2 if age at death was between 65 and 74, and 3 if age at death was greater than or equal to 75. A numerical variable *cityCode* was constructed from the string variable *city* by sorting the city codes alphabetically and then assigning a numerical value to each starting with 1 and ending with 108. The daily count of deaths from cardiovascular disease is stored in the variable *cvd*. The variable *tmpd* is the mean temperature for that day. Relative humidity is *rhum*. The variable *pm10trend* represents the daily mean of 1-year trends in airborne particulate matter. *Crash* is a dummy variable which equals 1 if the date is either 10/21/1987, 10/22/1987, or 10/23/1987. These dates correspond to the 1987 market crash.

Methods

Many of the papers utilizing the NMMAPS database employ a variety of smoothing splines in their models. We take a simpler approach by employing panel data negative binomial regression and panel data Poisson regression techniques. The relationship we are trying to estimate is stated as

$$cvd = \beta_0 + \beta_1 tmpd + \beta_2 rhum + \beta_3 pm10trend + \beta_4 garchseries + \beta_5 crash + \varepsilon \quad [3]$$

We estimate this model by age category using negative binomial regression.

Negative binomial regression is preferred to Poisson regression when the dependent variable exhibits overdispersion (i.e.- where the standard deviation is greater than the mean). In the presence of overdispersion, Poisson regression under-fits the model. See the textbook discussion by J. Scott Long and Jeremy Freese for further details.

Results

There are three age groups and three GARCH series, therefore we ran 9 different negative binomial regressions. The following table summarizes the results for the three age groups using the *garchhigh2* series.

The coefficient on *garchhigh2* is significant for people below 65 and for people between 65 and 75, but not for people over 75. For people below the age of 65, a one unit increase in the *garchhigh2* series will increase the number or cardiovascular deaths by 0.115% or 1.15 more deaths per 1,000 people. For people between the age of 65 and 75, a one unit increase in the *garchhigh2* series will result in a 0.107% increase in deaths, or 1.07 more deaths per 1000 people. For people 75 and over, cardiovascular deaths are predicted to increase by 0.0037% when the *garchhigh2* series increases by one unit. By the age of 75, perhaps most people have gotten their money out of the market.

		tmpd	pm10trend	rhum	garchhigh2	crash	_cons
Below 65	Coef.	-.0025334	.0123755	-.0001547	.0011514	-.0701652	6.305619
	Std. Err.	.000099	.0005101	.0000945	.0002126	.0376695	.6773017
	z	-25.59	24.26	-1.64	5.42	-1.86	9.31
	P>|z|	0.000	0.000	0.102	0.000	0.063	0.000
65 to 75	Coef.	-.0034792	.0149423	-.0004755	.0010702	-.0716454	9.122396
	Std. Err.	.0000893	.0004565	.0000853	.0001913	.0339402	9.152999
	z	-38.94	32.73	-5.57	5.60	-2.11	1.00
	P>|z|	0.000	0.000	0.000	0.000	0.035	0.319
Over 75	Coef.	-.004579	-.0017327	.0000629	.0000373	.0165686	4.858778
	Std. Err.	.0000583	.0002958	.0000556	.0001288	.0221822	.0363057
	z	-78.59	-5.86	1.13	0.29	0.75	133.83
	P>|z|	0.000	0.000	0.257	0.772	0.455	0.000

In previous work, we estimated the model for the 10 largest cities in the NMMAPS dataset and utilized the vix as a measure of volatility. The table below summarizes those results.

Age Category	vix Coefficient	% chg for 1 unit chg in vix
age <=64	0.0008336	0.083 %
65<=age<=74	0.0013926	0.139 %
75<= age	−0.0003970	−0.040 %

Notes

1 Peng RD, Welty LJ (2004). "The NMMAPSdata Package," R News, 4 (2), 10--14.

2 Instructions for installing the NMMAPS database can be found at http://www.ihapss.jhsph.edu/data/NMMAPS/R/

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Greenbacks and Black Gold: An Examination of the Statistical Relationship between the Dollar and the Price of Oil

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Abstract

As the global economy evolves, changes in the interaction between the value of the American dollar and the price of key commodities are to be expected. This paper evaluates the changing nature of the relationship between the value of the trade-weighted dollar index and the dollar price of oil using data from the period 1986-2009. In particular, it shows that in recent years (since 1999) an inverse relationship between the value of the dollar index and crude oil prices occurred. The paper also attempt to provide explanations for this recent observation of the negative link between dollar value and crude oil prices. Two particular aspects highlighted are – the growing significance of oil demand from fast growing emerging economies (that is, rising importance of non-US oil demand), and the increased interest in commodity investments among speculators and financial market participants as a hedge against dollar weakness and inflationary concerns.

Introduction

Many financial market observers and commodity traders have in recent years suggested the possibility of a link between oil prices and the value of the US dollar. It is currently not uncommon to find financial press reports noting that a weakening dollar may be behind rising oil prices, or alternately, that a strong dollar may be pushing oil prices down (Birkner, 2009). There is, however, no established consensus in the economic literature regarding the nature of the relationship between oil prices and the dollar. This paper hopes to contribute by undertaking a simple statistical and economic analysis of the relationship between oil prices and the value of the US dollar index, using recent data.

We first examine the statistical relationship between monthly crude oil prices and the value of the dollar during the period 1986 and 2009. A primary goal of our paper is to capture evidence of the presence of a link between oil prices and the value of the dollar, and to establish the direction of causality. Our findings suggest that, unlike the period prior to 1999, a statistical link between crude oil prices and the dollar index occurs between 1999 and 2009. Additionally, our analysis suggests that variations in the value of the dollar index Granger causes oil price changes.

Following our statistical evaluation of the relationship between oil prices and the dollar index, we attempt to explain the observed direction of causation between the two variables during recent years. We specifically focus on two broad sets of explanations to explain the negative impact of the value of the US dollar index on crude oil prices. Specifically, we emphasize the impact in recent years of a decrease in the significance of US demand for oil (which is relatively stable and in-elastic) and the concomitant increase in the significance of demand for oil from fast growing emerging markets (where consumption levels are rising rapidly). Also, we highlight the role played by financial speculators and investors pursuing investment alternatives to a weakening dollar. Recently, whenever the dollar has weakened and whenever concerns regarding US inflation expectations have grown, many speculators and investors have turned to commodities such as oil, which may act as a hedge against a falling dollar or high inflation.

The rest of the paper is organized as follows. In Section II, we discuss the statistical analysis (structural break tests and Granger causality tests) undertaken to establish the ties between dollar value and crude oil prices. Section III examines the factors that may have led to the negative relationship between the dollar and crude oil price in recent years. Finally, we conclude in section IV.

Examining the Dollar Index – Crude Oil Price Link

Earlier studies have noted the presence of a link between the value of the US dollar and the dollar price of crude oil. For instance, Krugman (1980) and Golub (1983) argued that rising oil prices transfer wealth from oil importers to oil exporters. With their additional wealth, exporters choose to invest in dollar assets. Their dollar asset purchases increase dollar demand, hence the dollar appreciates. Their argument suggests that the direction of causation goes from oil prices to the value of the dollar. More recently, Benassy-Querr, et al., (2007) find causation running from oil prices to the dollar exchange rate at a 10% significance level for the period ending in the early 2000s. Also, Medlock and Jaffe (2009) suggest that rising oil prices

expand the US trade deficit which leads to a weaker dollar. The weak dollar in turn drives oil prices upward,, and a self perpetuating cycle is started.

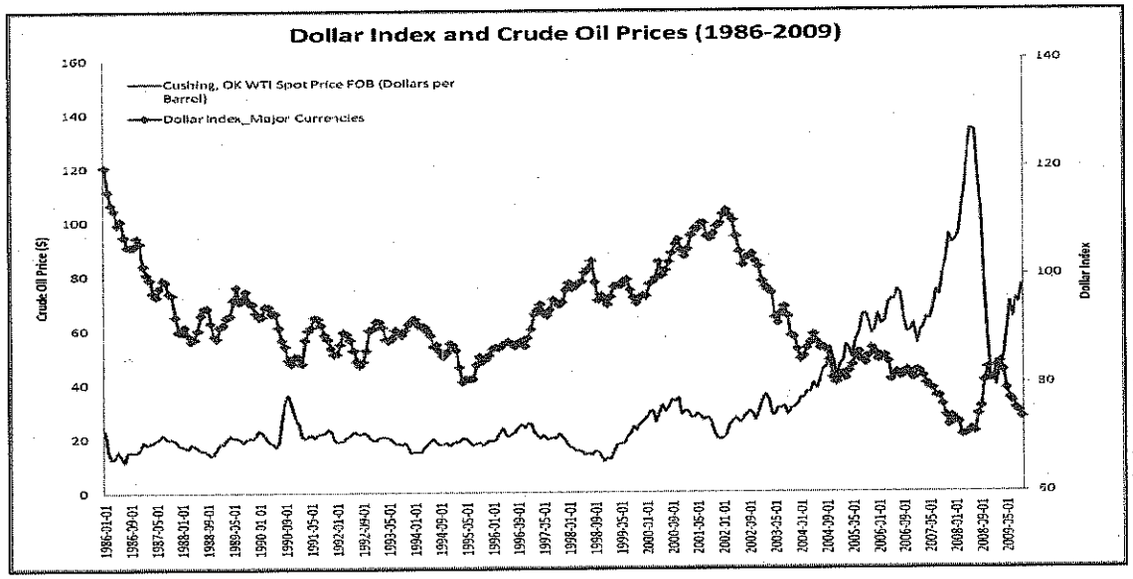
This study attempts to unravel the direction of the causality between oil prices and the value of the dollar index. Specifically, we attempt to answer three interesting questions regarding the relationship between dollar value and crude oil prices:

- Does a statistical relationship exist between the value of the dollar index and crude oil price?
- Is the relationship between the dollar index and crude oil prices observed only in recent data periods or has the link existed for longer durations?
- If a relationship exists, what is the direction of causality? That is, does the dollar value Granger cause an oil price change or does the oil price change Granger cause a dollar value change?

Our analysis covers the period between 1986 and 2009. We examine monthly data from early 1986 to the fall of 2009. The dollar index used in our analysis is the trade weighted-major currencies dollar index constructed by the US Federal Reserve (Data was obtained from the *FRED II Database – Federal Reserve Bank of St. Louis*[1]). For oil price, we use the monthly spot price of West Texas Intermediate crude oil price (Cushing, OK; units - Dollars per Barrel). Data on oil prices were obtained from the Energy Information Administration (US Department of Energy).

Figure 1 shows the times series of crude oil prices and the dollar index between 1986 and 2009 – our full sample period. We separate our full sample into two time periods – one between 1986 and 1998 and the other between 1999 and 2009 – in Figures 2 and 3.

Figure 1: US Dollar Index & Crude Oil Prices (1986-2009)



[1] Note: The Fed describes major currencies based dollar index as a: "weighted average of the foreign exchange value of the U.S. dollar against a subset of the broad index currencies that circulate widely outside the country of issue". Major currency index includes the Euro Area, Canada, Japan, United Kingdom, Switzerland, Australia, and Sweden.

Figure 2: US Dollar Index & Crude Oil Prices (1986-1998) – Time Series & Scatter Plot

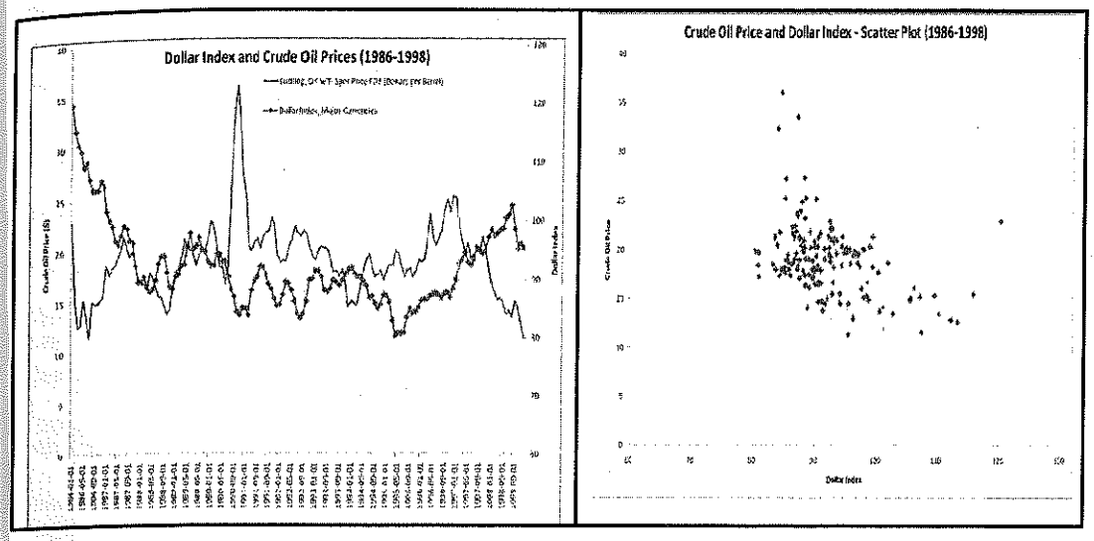


Figure 3: US Dollar Index & Crude Oil Prices (1999-2009) – Time Series & Scatter Plot

The choice of Dec 1998 as a break point is critical because it represents the lowest monthly WTI crude oil price ($11.35 per barrel) observed during the entire sample period. A graphical evaluation of Figures 2 and 3 indicates that there is a distinct change in the relationship involving crude oil prices and the dollar index going from one period to the next. Careful observation suggests no clear long-term structural relationship between crude oil price and the dollar index between 1986 and 1998. However, for the period between 1999 and late 2009, there are indications of a clear negative relationship between the two variables. The scatter plots confirm these preliminary observations.

We next undertake a more thorough and statistically rigorous investigation of the interaction between the two variables by conducting a Granger causality test for the full sample (1986-2009), and for sub-sample 1 (1986-1998) and sub-sample 2 (1999-2009). Before proceeding with Granger causality tests, we first attempt to validate our choice of Dec 1998 as the specific structural breakpoint by undertaking a couple of useful statistical tests. Testing for a structural breakpoint was undertaken using the *Quandt-Andrews Unknown Breakpoint Test* (Super F Test). The test procedure evaluated 28 break

points between 1996 and 1998 and it identified Dec, 1998 as a statistically significant breakpoint (Table 1). We used the *Chow Breakpoint Test* (Table 2) to validate the choice of Dec 1998 as the structural breakpoint period for our analysis.

Table 1: Quandt-Andrews Breakpoint Test

Quandt-Andrews Unknown Breakpoint Test
Null Hypothesis: No breakpoints within trimmed data
Equation Sample: 1986M01 2009M08
Test Sample: 1996M09 1998M12; Number of breaks compared: 28

Statistic	Value	Prob.
Maximum LR F-statistic (1998M12)	278.2182	0.0000
Maximum Wald F-statistic (1998M12)	278.2182	0.0000
Exp LR F-statistic	135.8117	0.0000
Exp Wald F-statistic	135.8117	0.0000
Ave LR F-statistic	233.9359	0.0000
Ave Wald F-statistic	233.9359	0.0000

Table 2: Chow Breakpoint Test

Chow Breakpoint Test: 1998M12
Null Hypothesis: No breaks at specified breakpoints
Varying Regressors: DOLLAR_INDEX_MC
Equation Sample: 1986M01 2009M08

F-statistic	225.8218	Prob. F(1,281)	0.0000
Log likelihood ratio	167.5045	Prob. Chi-Square(1)	0.0000
Wald Statistic	225.8218	Prob. Chi-Square(1)	0.0000

A key aspect of Granger causality test analysis is the choice of an appropriate set of lags for the variables of interest. To determine the proper number of lags to use in the Granger causality test, we employed the *Lag Exclusion Wald Test*. This test suggests that a three period lag would be optimal (Table 3).

Table 3: VAR Lag Exclusion Wald Tests (Note: WTI_SPOT_PRICE refers to crude oil price)

Sample: 1986M01 2009M08; Included observations: 278;
Chi-squared test statistics for lag exclusion [Numbers in [ ] are p-values]:

	WTI_SPOTPRICE	Joint
Lag 1	495.8877	495.8877
	[0.000000]	[0.000000]
Lag 2	3.017031	3.017031
	[0.082394]	[0.082394]
Lag 3	4.601966	4.601966
	[0.031935]	[0.031935]
Lag 4	0.025537	0.025537
	[0.873037]	[0.873037]
Lag 5	1.093540	1.093540
	[0.295688]	[0.295688]
Lag 6	6.948941	6.948941
	[0.008387]	[0.008387]

We also undertook *VAR Lag Order Selection Criteria* procedure (using EVIEWS), and three lags were found to be appropriate using the Schwarz Information Criteria (result not shown).

The Granger causality test (using three lags) was conducted for the following three sample periods: Full Sample (1986-2009); Sample I (1986-1998); and, Sample II (1999-2009). As shown in Table 4, we find that the hypothesis that changes in dollar index Granger caused changes in crude oil prices cannot be rejected only for the 1999-2009 sample period. Based on our analysis, it is apparent that only during the past decade or so, we find evidence of a statistically significant link between the value of the dollar and crude oil prices. Also, the direction of causality appears to go from the dollar value to crude oil prices.

Table 4: Pairwise Granger Causality Tests

Pairwise Granger Causality Tests

Sample: 1986M01 2009M08
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
DOLLAR_INDEX_MC does not Granger Cause WTI_SPOT_PRICE	281	0.72294	0.5390
WTI_SPOT_PRICE does not Granger Cause DOLLAR_INDEX_MC		1.00996	0.3887

Sample: 1986M01 1998M12
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
DOLLAR_INDEX_MC does not Granger Cause WTI_SPOT_PRICE	153	0.48630	0.6923
WTI_SPOT_PRICE does not Granger Cause DOLLAR_INDEX_MC		0.57509	0.6323

Sample: 1999M01 2009M08
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
DOLLAR_INDEX_MC does not Granger Cause WTI_SPOT_PRICE	128	3.59625	**0.0156**
WTI_SPOT_PRICE does not Granger Cause DOLLAR_INDEX_MC		0.95334	0.4172

Factors Driving the Dollar Value-Crude Oil Price Relationship

In this section, we focus on three possible explanations for the growing negative link between the value of the dollar and the price of crude oil. First, it is highly likely that the low interest rate environment prevalent during much of the past decade encouraged investors to search for higher yields in commodity markets. Typically, low interest rates are expected to lead to less risk aversion and greater focus on non-traditional financial instruments. As real interest rates declined during the past decade, and as the dollar weakened, the search for higher yields and for protection against a weak dollar led many investors to the commodity markets.

There is growing evidence that crude oil contracts were being used as a hedge against dollar weakness and inflationary concerns. For instance, Medlock and Jaffe (2009) note that the non-commercial share of open interest contracts in the US crude oil futures market increased roughly during this period from 20% to 55%. This increase in oil futures demand contributes to higher oil futures prices during periods of dollar weakness. Rising crude oil futures pushes up spot oil prices.

To undertake an examination of the impact of a low interest rate environment, we examine the relationship between real interest rates and crude oil prices. Prior to undertaking a regression analysis using time series data, it is appropriate to check for stationarity. Augmented Dickey Fuller Test and the Phillip-Perron Test were used to test for unit roots. The test results (presented in the Appendix) suggest that crude oil prices (WTI_SPOT_PRICE), the value of the dollar index

(DOLLAR_INDEX_MC) and real interest rates[2] (R) all exhibit non-stationarity. Hence, the first differences of these variables were used in our regression analysis. Table 5 presents the regression results for two sets of regressions. First, we find that the value of the dollar index has a statistically significant impact on crude oil prices only in recent periods, a result that reinforces our conclusion from the previous section. The dummy variable (D_99_08 takes a value of 0 for the period between 1986 and 1998 and takes a value of 1 for the period between 1999 and 2008) is used to set up a regression that attempts to check for the impact of changes in the value of the dollar index on crude oil prices. Results clearly suggest that the value of the dollar index negatively impacts crude oil prices for only the most recent period.

Taking into account the relationship between the value of the dollar index and crude oil prices, we next consider whether real interest rates also affect oil prices. Our findings suggest that real interest rates have a significant and negative effect on crude oil prices. This is as expected given our earlier discussion.

Table 5: Regression Results (Note D(variable) refers to the first difference of the variable)

Dependent Variable: **D(WTI_SPOT_PRICE)** Method: Least Squares
Sample (adjusted): 1986M02 2009M08
Included observations: 283 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.095706	0.293793	-0.325759	0.7449
D_99_08	0.362623	0.436870	0.830048	0.4072
D_9908*D(DOLLARINDEXMC)	-1.131078	0.274259	-4.124122	0.0000
D(DOLLAR_INDEX_MC)	-0.131328	0.182276	-0.720491	0.4718
R-squared	0.125444	Mean dependent var		0.170035
Adjusted R-squared	0.116040	S.D. dependent var		3.871182
S.E. of regression	3.639652	Akaike info criterion		5.435686
Sum squared resid	3695.931	Schwarz criterion		5.487212
Log likelihood	-765.1496	Hannan-Quinn criter.		5.456347
F-statistic	13.33969	Durbin-Watson stat		1.140856
Prob(F-statistic)	0.000000			

Dependent Variable: **D(WTI_SPOT_PRICE)** Method: Least Squares
Sample (adjusted): 1986M02 2009M08
Included observations: 283 after adjustments

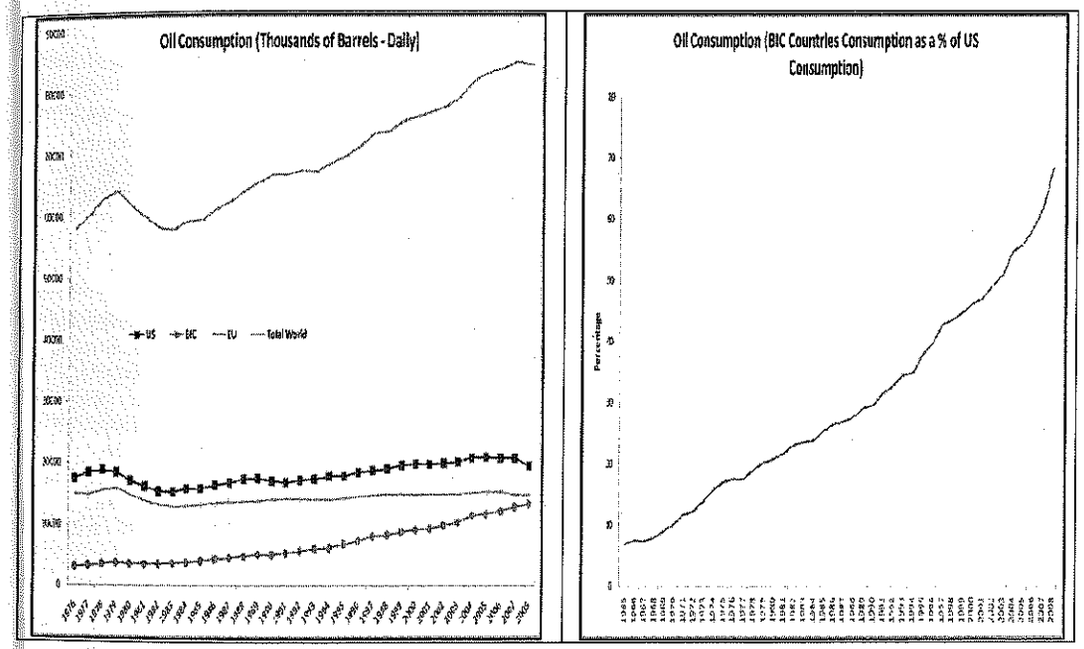
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.082472	0.201504	0.409279	0.6826
D_99_08*D(DOLLAR_INDEX_MC)	-0.976566	0.195082	-5.005922	0.0000
D(R)	-3.351764	0.502906	-6.664796	0.0000
R-squared	0.242122	Mean dependent var		0.170035
Adjusted R-squared	0.236709	S.D. dependent var		3.871182
S.E. of regression	3.382118	Akaike info criterion		5.285425
Sum squared resid	3202.842	Schwarz criterion		5.324070
Log likelihood	-744.8877	Hannan-Quinn criter.		5.300920
F-statistic	44.72633	Durbin-Watson stat		1.245222
Prob(F-statistic)	0.000000			

[2] Monthly real interest rates were calculated by subtracting the inflation rate (percentage change in CPI) from the yield on the 3-month T-Bill.

A second explanation is based on the fact that oil is priced in dollars internationally (Brown, et al. 2008). Whenever the US dollar declines, the real price of oil to foreign purchasers abates (especially in countries whose currencies are appreciating relative to the dollar). Thus, the world quantity demanded of oil may remain strong despite the price pressures wrought upon American consumers by a falling dollar. The level of demand destruction from the rising dollar price of crude oil has been minimal or non-existent in recent years. On the supply side, OPEC member nations, especially those in the Middle East, are increasingly tied economically to the EU and East Asia and not as dependent on conditions in the US. In fact, imports from EU account for a much bigger share (relative to imports from the US) of total imports by oil exporting countries of the Middle East. Hence, petrodollar recycling has become less important. In fact, a weakening dollar these days is more likely to elicit upward price pressure on crude oil prices as Middle East (and OPEC) consumers try to maintain their purchasing power in terms of the euro, pound or the yen rather than in terms of the US dollar.

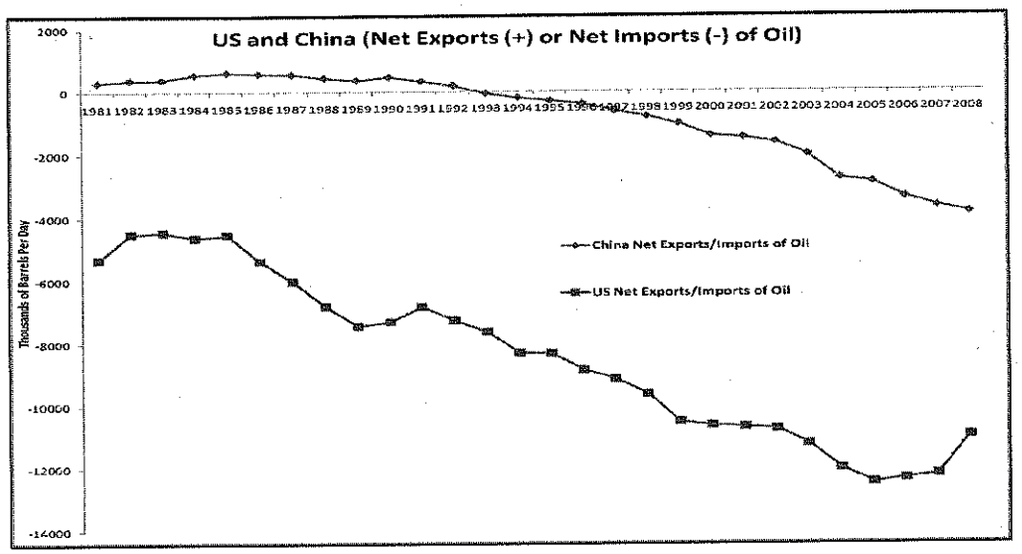
Lastly, an important factor driving the negative link between the value of the US dollar index and crude oil prices is a changing global pattern of oil consumption (Hamilton, 2009). While the US still remains the world's largest consumer of oil, its share of the global market place has started to decline of late. In fact, much of the global growth in oil consumption during the past decade was driven by fast growing emerging markets. Figure 4 clearly highlights the growing influence of emerging countries on oil markets (and thus on oil prices). It is apparent that much of the increase in global oil demand in recent periods is being driven by increased consumption by fast growing countries such as Brazil, India and China (BIC). Consumption growth in advanced economies such as the US and the EU are more muted.

Figure 4: Oil Consumption - Major Regions (Source: BP Statistical Review – 2009)



China has fast become one of the most important crude oil consumers as its rapid economic growth creates legions of new middle class customers. A startling development over the past two decades has been the evolution of China from being a net exporter to one of the biggest importers of oil. As shown in Figure 5, the rise of China as a major oil importer is apparent. As China rises to become a major player in global oil markets, it has reduced the significance of the US and the American dollar in the crude oil marketplace.

Figure 5: US and China – Net Export (+), Net Import (-) of Oil



It is worth noting some export dependent emerging markets such as China peg their currencies to the US dollar. As a result, they may see their export competitiveness actually improve due to dollar weakness against other major currencies. This in turn may lead to an economic upswing in such economies, which may end up boosting their consumption of energy and thus their oil consumption. As their economic weight grows, their effect on the crude oil market may be a key factor behind the recently observed link between the value of the dollar and crude oil prices.

Conclusion

This paper has provided a thorough statistical examination of the relationship between the value of the dollar index and the crude oil price. Clear evidence in recent years reveals a significant and negative relationship exists between dollar value and crude oil price. Our analysis of the direction of causality indicates that the changes in the value of the dollar negatively impacts crude oil prices. Among the likely reasons behind the recently observed links between the US dollar index and crude oil prices are the growing role of financial market participants and speculators in the commodity markets as they search for better yields (in a low interest environment) and attempt to overcome the effects of dollar weakness. Additionally, the increasing role played by non American consumers and producers in the global crude oil market is of great significance. The lack of oil demand destruction in the face of rising dollar price of oil observed in recent years is a clear indicator of the evolving global landscape. The extraordinary growth in China and other emerging markets and their increasing clout in the evolving global landscape. The extraordinary growth in China and other emerging markets and their increasing clout in the commodity markets seem to be a likely factor behind the dollar value and oil price link.

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APPENDIX – UNIT ROOT TESTS

Null Hypothesis: **WTI_PRICE has a unit root**
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.984537	0.0102
Test critical values:	1% level	-3.991053	
	5% level	-3.425898	
	10% level	-3.136128	

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.637470	0.2640
Test critical values:	1% level	-3.990817	
	5% level	-3.425784	
	10% level	-3.136061	

Null Hypothesis: **D(WTI_PRICE) has a unit root**
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.597219	0.0000
Test critical values:	1% level	-3.991412	
	5% level	-3.426073	
	10% level	-3.136231	

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.512742	0.0000
Test critical values:	1% level	-3.990935	
	5% level	-3.425841	
	10% level	-3.136094	

Null Hypothesis: **DOLLAR_INDEX has a unit root**
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.233649	0.4686
Test critical values:	1% level	-3.991053	
	5% level	-3.425898	
	10% level	-3.136128	

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.584352	0.2879
Test critical values:	1% level	-3.990817	
	5% level	-3.425784	
	10% level	-3.136061	

Null Hypothesis: **D(DOLLAR_INDEX) has a unit root**
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.02969	0.0000
Test critical values:	1% level	-3.991053	
	5% level	-3.425898	
	10% level	-3.136128	

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-11.42288	0.0000
Test critical values:	1% level	-3.990935	
	5% level	-3.425841	
	10% level	-3.136094	

Null Hypothesis: **R has a unit root**
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.470406	0.3427
Test critical values:	1% level	-3.992670	
	5% level	-3.426682	
	10% level	-3.136590	

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.775727	0.2076
Test critical values:	1% level	-3.990817	
	5% level	-3.425784	
	10% level	-3.136061	

Null Hypothesis: **D(R) has a unit root**
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.328654	0.0001
Test critical values:	1% level	-3.992670	
	5% level	-3.426682	
	10% level	-3.136590	

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-12.51349	0.0000
Test critical values:	1% level	-3.990935	
	5% level	-3.425841	
	10% level	-3.136094	

International Diversification: Evidence from the Emerging Markets

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Abstract

This paper exams the correlations in financial crises (2007 to 2009) between the U.S. financial markets and a few selected emerging markets -- China, India, Russia, Brazil, South Africa, Mexico, Indonesia, Korea and Argentina. All data and information about trading prices, returns, volumes, market capitalization, and company related statistics were obtained through Bloomberg which provides 24-hour, instant and current financial, economic and political information covering markets around the globe. It also provides analytics, historical data, up-to-minute news reports, economics statistics and political commentaries.

Introduction

Emerging markets have outperformed US markets during the 1990's. The high performance and the increasing availability of information have led to an increased interest by both academics and practitioners. Divecha,et. al. (1992) present statistical evidence of performance and risk, and discuss the portfolio implications of investing part of your funds in emerging markets.

There are logical reasons that a pattern observed in developed markets will also appear in emerging markets; however, the logical converse is also possible. There may be an 'internationalization of markets' consistent with technological advances, the ease of capital flows across borders, and improved information resources. Certainly for major markets, capital flows freely from one market to another with ease, so called hot money. Emerging markets, on the other hand, often place restrictions on capital flows, have their own rules of taxation that may discriminate against or discourage foreign investors, and in some cases discriminate between domestic and foreign investors through classes of shares. These individual country factors may cause differences between patterns observed in developed markets versus those of developing or emerging markets. Further, there seems to be a behavioral pattern that may affect pricing and the risk/return tradeoff we have come to expect in developed markets. Investing in stocks is viewed as more akin to gambling than to investing by domestic investors in some emerging markets. Traditional patterns of saving involve placing money in an account similar to a savings account, coupled with an attitude of frugality as a means to accumulate wealth. If investors treat the stock market as a gambling arena, the link between risk and return may be broken. Lack of liquidity then prevents arbitrage trading from reestablishing the link.

Table 1: Selected Emerging Market Indices and the DJIA for the US

Country	Index	Ticker
Argentina	The Argentina Stock Market General Index	MERVAL
Brazil	The Brazilian Stock Markets I-Senn Index	IBOV
China	The China CLSA Index B	SCHCOMP
India	The Bombay Sensitivity Index	SENSEX
Indonesia	The Jakarta Composite Index	JCI
Mexico	The Mexico Bolsa Index	MEXBOL
South Africa	The Johannesburg All Market Index	JALSH
South Korea	The Korea Composite Index	KOSPI
United States	Dow Jones Industrial Average	DJIA

Source: Bloomberg

Data and Findings

Data and analysis are obtained through Bloomberg's 20,000 international company universe. Bloomberg provides 24-hour, instant and current financial, economic and political information covering markets around the globe. It also provides analytics, historical data, up-to-minute news reports, economic statistics and political commentaries. Constant upgrades and enhancements of the system are some of the most valuable attributes of the Bloomberg service. Table 1 shows the selected indexes in emerging markets and two leading indexes in the U.S.

Table 2: Correlation Coefficients of Selected Emerging Market Indices and DJIA 2000-2002

INDEX	*IBOV*	*DJIA*	*JAL*	*JCI*	*KOPSI*	*MER*	*MEX*	*RISI*	*SEN*	*SHCP*
IBOV	1.000	0.480	0.116	0.026	0.084	0.339	0.446	0.227	0.096	-0.043
DJIA	0.480	1.000	0.360	0.005	0.146	0.242	0.516	0.270	0.127	-0.037
JAL	0.116	0.360	1.000	0.041	0.327	0.186	0.304	0.398	0.260	-0.040
JCI	0.026	0.005	0.041	1.000	0.114	0.003	0.020	0.029	0.144	0.000
KOSPI	0.084	0.146	0.327	0.114	1.000	0.064	0.193	0.257	0.348	0.003
MER	0.339	0.242	0.186	0.003	0.064	1.000	0.306	0.174	0.043	-0.206
MEX	0.446	0.516	0.304	0.020	0.193	0.306	1.000	0.277	0.134	-0.023
RISI	0.227	0.270	0.398	0.029	0.257	0.174	0.277	1.000	0.232	-0.030
SEN	0.096	0.127	0.260	0.144	0.348	0.043	0.134	0.232	1.000	0.010
SHCP	-0.043	-0.037	-0.040	0.000	0.003	-0.206	-0.023	-0.030	0.010	1.000

Bloomberg: daily returns 5/14/2000 to 5/14/2002

Table 2 shows the correlation coefficients of selected emerging market indices and the Dow Jones Industrial Average between 5/14/2000 to 5/14/2002, most of the coefficients are relative low, except markets which are geographically close to each other such as U.S. and Mexico, Argentina and Brazil. But if an U.S. institutional investor who hold a portfolio with stocks from China, India, Indonesia in addition to U.S. market will definitely benefit from international diversification theoretically by reducing its portfolio risk by adding stocks with relative low or negative correlation coefficient.

However, when we compare the same correlation coefficients by using daily returns during the latest financial crisis between 5/14/2006 to 5/14/2009, we have observed the correlation coefficients increase and became relative high compare with those coefficients before the financial crisis except in Chinese market which still had relative low correlation coefficients with other market. This implies that any as the world economy become more integrated, the merit of international diversification by adding international stocks into a portfolio has been reduced if not totally eliminated.

Table 3: Correlation Coefficients of Selected Emerging Market Indices and DJIA 2007-2009

INDEX	*IBOV*	*DJIA*	*JAL*	*JCI*	*KOPSI*	*MER*	*MEX*	*RISI*	*SEN*	*SHCP*
IBOV	1.000	0.769	0.558	0.313	0.350	0.789	0.832	0.478	0.371	0.203
DJIA	0.769	1.000	0.373	0.153	0.226	0.652	0.791	0.240	0.333	0.027
JAL	0.558	0.373	1.000	0.468	0.502	0.532	0.499	0.664	0.460	0.195
JCI	0.313	0.153	0.468	1.000	0.606	0.371	0.273	0.469	0.515	0.280
KOSPI	0.350	0.226	0.502	0.606	1.000	0.345	0.349	0.513	0.531	0.349
MER	0.789	0.652	0.532	0.371	0.345	1.000	0.704	0.477	0.336	0.176
MEX	0.832	0.791	0.499	0.273	0.349	0.704	1.000	0.416	0.345	0.108
RISI	0.478	0.240	0.664	0.469	0.513	0.477	0.416	1.000	0.452	0.189
SEN	0.371	0.333	0.460	0.515	0.531	0.336	0.345	0.452	1.000	0.310
SHCP	0.203	0.027	0.195	0.280	0.349	0.176	0.108	0.189	0.310	1.000

Bloomberg: daily returns 5/14/2007 to 5/14/2009

Conclusions

This paper exams the correlations in before and after financial crisis between the U.S. financial markets and a few selected emerging markets -- China, India, Russia, Brazil, South Africa, Mexico, Indonesia, Korea and Argentina. We found that the correlation coefficients of selected emerging market indices and the Dow Jones Industrial Average between 5/14/2000 to 5/14/2002, most of the coefficients are relative low, some were negative, however, we have observed the correlation coefficients increased and became relative high compare with those coefficients before the financial crisis. The relative high correlation between international financial markets implies that the merit of international diversification by adding international stocks into a portfolio has been reduced if not totally eliminated.

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Understanding Hispanic American College Students' Attitudes about Money

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Abstract

This study was to investigate Hispanic American college students' attitudes about money and to test significant differences with selected variables. Included in the questionnaire was comprised of 29 items regarding respondent's attitudes about money, developed by Yamauchi and Templer (1982), to discern patterns in participants' preferences. Statistical analyses revealed that there were significant differences between the money attitude dimensions with respect to gender. The results of this study are important to the understanding of financial behavior of college students and to enable professionals in the field of family and consumer sciences to be more effective in their advice and teaching.

Introduction

There have been a number of psychometrically based attempts to measure money attitudes among people in general. Yamauchi and Templer (1982) constructed the Money Attitude Scale (MAS) from an original set 62 items, of which 34 emerged, defining five factors. Two of the factors correspond to views on money as compelled mainly by the power and status that is associated with wealth, or the obsessive need to save. More precisely, items loading on the factor for Power-Prestige pointed to the use of money as a symbol of success to impress and influence others. Items loading on the factor for Retention-Time correspond to careful spending behavior and meticulous planning of monetary resources to get a sense of security. Items loading on two of the remaining factors pertain more clearly to emotionladen aspects.

The factor titled Distrust was interpreted as reflecting suspicion and doubt in situations involving money, and the other factor entitled Anxiety was taken to reflect distress and worry over money matters. The fifth factor related to the concern with paying for quality as a consumer. As Yamauchi and Templer dropped the latter factor, the final scale consisted of 29 items. Their scale has been studied in several papers (Gresham and Fontenot, 1989; Medina, Saegert, and Gresham, 1996; Roberts and Sepulveda, 1999; Yang and Lester, 2002) and has been found to have acceptable reliability.

Money attitudes were measured using Yamauchi and Templer's (1982) money attitude scale (MAS). Although Furnham's (1984) money beliefs and behavior scale (MBBS) appears more comprehensive, problems with psychometric attributes and cross-cultural issues persist (Bailey, 1987; Yang and Lester, 2002). Additionally, Tang's (1992) money ethic scale (MES) does not include an "anxiety" dimension identified in Yamauchi and Templer's (1982) work. As noted previously, reliability and validity of the Yamauchi and Templer (1982) instrument suggest a psychometrically sound measure.

The objectives of this study were to measure attitudes toward money and identify the relationship between student attitudes and selected observed variables, such as gender, current academic status by applying the Money Attitude Scale (MAS) (Yamauchi and Templer, 1982) to business school students.

Methods

Using a relatively more homogeneous group such as undergraduate and graduate students is for minimizing random error that might occur by using a heterogeneous sample such as the general public (Calder, Phillips, & Tybout, 1981). Although the results of the studies conducted on such samples cannot be generalized, since the common aim of these studies were to test the transferability of the inventory to different environments, therefore, non-probability sampling techniques were found to be appropriate.

This study was used to simply describe Hispanic American college business students' attitudes toward money as well as to provide additional research regarding important variable, especially gender, related to student attitudes. The 29-item MAS (Yamauchi and Templer, 1982) was chosen because the subscales on the survey represent important attitudes that are related to student achievement. Also, MAS has been used in previous research and its reliability and validity indices have been empirically documented. The questionnaire was constructed in a Likert-type scale ranging from 1 to 5 (1= strongly disagree, 3 = neither disagree nor agree, 5 = strongly agree).

In the beginning, the instructor gathered consent from students who enrolled in an introductory statistics, macroeconomics, or microeconomics course at a university in South Texas during the fall semester 2009 and the spring semester 2010. After a brief introduction of this study, the questionnaire was handed out by the instructor to the students who would be willing to participate in this type of study in the classroom. It would be taken about 3 minutes to finish this questionnaire. Of course, students had the option of no participating in this type of study.

The analysis examined the psychometric properties of the original 29-item MAS. First, the dimensionality of MAS was assessed by examining the factor solution followed by Yamauchi and Templer (1982). Then, the *t*-test and one-way ANOVA were employed to compare gender difference and other variables specified in this study among the factors identified. Descriptive statistics of the 29-item MAS in this sample are shown in Table 1.

Table 1. Descriptive Statistics of Money Attitudes of Hispanic American College Students

Money Attitude Item (N = 224)	Mean	S.D.	Communalities
Power-Prestige			
I use money to influence other people to do things for me.	2.20	1.23	0.55
I must admit that I purchase things because I know they will impress others.	2.38	1.20	0.78
In all honesty, I own nice things in order to impress others.	2.16	1.14	0.71
I behave as if money were the ultimate symbol of success.	2.23	1.14	0.61
I must admit that I sometimes boast about how much money I make.	1.81	0.98	0.56
People I know tell me that I place too much emphasis on the amount of money a person has as a sign of his success.	1.79	1.00	0.56
I seem to find that I show more respect to people with more money than I have.	1.94	1.06	0.58
Although I should judge the success of people by their deeds, I am more influenced by the amount of money they have.	1.86	0.98	0.54
I often try to find out if other people make more money than I do.	2.21	1.16	0.35
Retention-Time			
I do financial planning for the future.	3.71	1.13	0.53
I put money aside on a regular basis for the future.	3.37	1.19	0.67
I save now to prepare for my old age.	2.91	1.26	0.46
I keep track of my money.	3.92	1.02	0.60
I follow a careful financial budget.	3.12	1.15	0.69
I am very prudent with money.	3.10	1.02	0.60
I have money available in the event of another economic depression.	2.76	1.19	0.51
Distrust			
I argue or complain about the cost of things I buy.	3.02	1.15	0.62
It bothers me when I discover I could have gotten something for less elsewhere.	3.82	1.09	0.72
After buying something, I wonder if I could have gotten something for less elsewhere.	3.46	1.05	0.67
I automatically say, "I can't afford it" whether I can or not.	2.65	1.12	0.52
When I buy something, I complain about the price I paid.	2.46	0.99	0.67
I hesitate to spend money, even on necessities.	2.45	1.12	0.58
When I make a major purchase, I have the suspicion that I have been taken advantage of.	2.63	1.13	0.65
Anxiety			
It's hard for me to pass up a bargain.	3.21	1.17	0.78
I am bothered when I have to pass up a sale.	2.89	1.19	0.77
I spend money to make myself feel better.	2.64	1.26	0.49
I show signs of nervousness when I don't have enough money.	3.03	1.24	0.73
I show worrisome behavior when it comes to money.	2.90	1.13	0.70
I worry I will not be financially secure.	3.41	1.25	0.69

Results

The sample consisted of 224 Hispanic American college students majoring in Business Administration. Of the total sample, 113 (50.4%) were female and 111 were male (49.6%). The majority of respondents were Junior (n = 98, 43.8%), followed by Sophomore (n = 79, 35.3%), Senior (n = 27, 12.1%), Freshman (n = 13, 5.8%), and Graduate students (n = 7,

3.1%). Approximately 29% of the total participants reported that they had shopped at department stores once every two weeks, 28% shopped at least once a week, 26% shopped once a month, 13% shopped once every three months, and 4% shopped once a year. Approximately 39% of the total participants reported that they had shopped online once a year, 30% once every three months, 19% once a month, 6% at least once a week, 5% once every two weeks, and 1% never shopped online. Approximately 67% and 92% of the total participants reported that they had owned credit cards and debit cards, respectively.

Reliability of the MAS, as measured by coefficient alpha, was reported as .77. Reliability coefficients for the four subscales of the final MAS; Power-Prestige, Retention-Time, Distrust, and Anxiety were reported as .84, .85, .79, and .75 respectively (Table 2).

Table 2. Descriptive Statistics and Reliability of the Four Identified Subscales

Money Attitudes (N = 224)	Mean	S.D.	Sample Cronbach's Alpha	Original Cronbach's Alpha	Dimension Items	Dimension Range
Overall			0.77	0.77	29	
Power-Prestige	18.58	6.55	0.84	0.81	9	5 ~ 45
Retention-Time	22.89	5.78	0.85	0.78	7	5 ~35
Distrust	20.47	5.08	0.79	0.73	7	5 ~ 35
Anxiety	18.07	4.86	0.75	0.69	6	5 ~ 30

The Table 3 presents the correlation matrix. It also analyzes the multicollinearity of the constructs. It means that constructs with correlation above ± 0.85 (Kline, 1985) can be considered the same. Conform Table 3 no correlation above this value was found. The strongest correlation found was between power-prestige and anxiety. It appears that a college business student characterized as power-prestige could be looking for the anxiety more applicable. Power-prestige was correlated with anxiety positively and retention-time negatively, while distrust had small correlation. Similarly, retention-time was negatively correlated with power-prestige and anxiety, while distrust had small correlation. However, anxiety had a significant correlation with power-prestige and distrust positively, but retention-time negatively. That is, college business students' attitudes about money were highly influenced by considering the topic with anxiety.

Table 3. Correlation among the Four Identified Subscales

Money Attitudes	Power-Prestige	Retention-Time	Distrust	Anxiety
Power-Prestige	1			
Retention-Time	-0.224**	1		
Distrust	0.095	0.110	1	
Anxiety	0.373**	-0.302**	0.332**	1

** Correlation is significant at the 0.01 level (2-tailed)

Since one of the purposes of the study is to compare the difference between female and male samples, the factor score of the four subscales was saved for further statistical analysis. In order to test the significant difference between the two samples, t-test is performed with the four-subscale score. Gender only had significant differences in Anxiety at the 0.10 level, but no significances in Power-Prestige, Retention-Time, and Distrust (Table 4). The results showed that female felt more worrisome and more anxious with money and in money situations than male, $t = -1.88$, $p = 0.061$. Male had no significant difference than female in Power-Prestige, $t = 1.37$, $p = 0.172$; in Retention-Time, $t = -0.279$, $p = 0.780$; and in Distrust, $t = -0.777$, $p = 0.439$.

Table 4. Gender Difference with the Four Identified Subscales

	Gender	N = 224	Mean	S.D.	*p*-Value (2-tailed)
Power-Prestige	Male	111	19.19	6.60	0.172
	Female	113	17.99	6.48	
Retention-Time	Male	111	22.78	5.92	0.780
	Female	113	23.00	5.67	
Distrust	Male	111	20.21	5.48	0.439
	Female	113	20.73	4.66	
Anxiety	Male	111	17.46	4.70	0.061
	Female	113	18.67	4.95	

In addition, a one-way ANOVA test was performed to examine the effects of student classification on the four subscales identified. As expected, significant differences with student classification were found in four of the dimensions. Those of significant difference were Distrust ($F(4, 219) = 2.644$, $p = 0.035$), and Anxiety ($F(4, 219) = 2.115$, $p = 0.080$); but no significant difference on Power-Prestige ($F(4,219) = 0.431$, $p = 0.786$, and Retention-Time($F(4,219) = 0.674$, $p = 0.611$).

The results also showed that significant differences with department store shopping behavior were found in four of the dimensions. Those of significant difference was Anxiety ($F(4, 219) = 2.601$, $p = 0.037$); but no significant difference on Power-Prestige ($F(4, 219) = 0.423$, $p = 0.792$), Retention-Time ($F(4,219) = 0.878$, $p = 0.478$); and Distrust ($F(4,219) = 0.638$, $p = 0.636$). Similarly, significant differences with online shopping behavior were found in four of the dimensions. Those of significant difference was Power-Prestige ($F(5, 218) = 2.048$, $p = 0.073$); but no significant difference on Retention-Time ($F(5,218) = 0.845$, $p = 0.519$); Distrust ($F(5,218) = 1.562$, $p = 0.172$), and Anxiety ($F(5, 218) = 0.627$, $p = 0.680$).

Conclusion

The objectives of this study were to investigate Hispanic American college students' attitudes about money and to test significant differences with selected variables, especially gender and student classification. A questionnaire survey was employed to collect primary data administered to 224 Hispanic American college students majoring in business administration. Included in the questionnaire was comprised of 29 items regarding respondent's attitudes about money using a five-point Likert-type Money Attitude scale, developed by Yamauchi and Templer (1982), to discern patterns in individuals' preferences. Statistical analyses revealed that there were significant differences between the money attitude dimensions with respect to gender and student classification as well. The results of this study are important to the understanding of financial behavior of college students and to enable professionals in the field of family and consumer sciences to be more effective in their advice and teaching.

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Microfinance: The Impact of Nonprofit and For-Profit Status on Financial Performance and Outreach

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Abstract

The authors use an international data set of microfinance institutions to test whether there are significant differences between nonprofit and for-profit microfinance institutions (MFIs). They test six hypotheses that are set up to mirror the expected differences between nonprofit and for-profit MFIs based on expected differences in mission. Given that nonprofits are expected to have more of a social mission and for-profit firms to be more profit-driven, the results presented here are quite counterintuitive (though consistent with previous investigations). The authors reject all six hypotheses, finding no significant difference between nonprofit and for-profit firms in terms of gender, loan size and the number of loans outstanding, interest rates charged and proportion of risky assets. Where they do find significant differences is in terms of financial performance (e.g., profit margins, operational self-sufficiency and expenses), though nonprofit, not for-profit firms, had superior financial performance.

Introduction

In the past five years, microcredit (issuance of small loans to poor entrepreneurs, lacking access to formal forms of credit) and its more general counterpart, microfinance (including microcredit and other financial instruments such as life insurance), have become popular development strategies. With Muhammad Yunus and the Grameen Bank receiving the 2006 Nobel Peace Prize, following on the heels of the United Nations' declaration of 2005 as the International Year of Microcredit, the world has quickly become aware of the potential for microfinance. By 2009 the Microcredit Summit Campaign reported that over a hundred million of the poorest people have been reached with microfinance (Daley-Harris, 2009; Microcredit Summit, 2009).

Modern microfinance can be traced to Bangladesh, which is considered the "cradle" of microfinance. With the formation in the 1970s of Grameen Bank, Bangladesh Rural Advancement Committee (BRAC) and ASA, all Bangladeshi non-governmental organizations (NGO's) with clear missions for poverty-alleviation in one of the world's poorest nations, the role of the NGO in microfinance has been clearly established (Smillie, 2009). Both Grameen Bank and ASA, in particular, however, have demonstrated that microfinance can provide a very sustainable business model for NGOs. For example, in 2001, ASA declared itself "donor free" and achieved a number-one ranking on Forbes' list of microfinance institutions (MFIs) in 2007 (ASA, 2010; Swibel, 2007). Grameen Bank has been sustainable since at least the 1980s. Yunus states that "from October 2, 1983, onward (Grameen) could argue our side as a peer institution—and one that was financially outperforming traditional banks" (Yunus,1999, p. 123). More recently, Yunus' (2007) discussion of Grameen's development of "social businesses" suggests an internal cross-subsidy within the Grameen Bank from the very-sustainable microfinance portion of the business to other less-sustainable ventures.

Not surprisingly, the opportunity for positive net income and a willingness to gain market share has attracted some for-profit firms to microfinance. Perhaps the most famous of these is Banco Compartamos (seventh on Forbes' 2007 list—see Swibel, 2007), which became a publicly-traded, for-profit MFI after beginning as a nonprofit NGO (see Chu and Cuellar, 2008). While small, for-profit moneylenders have always been a part of credit markets for the poor, only recently have for-profit MFIs entered the market. Notwithstanding Compartamos' success, there is still some question whether this is a viable business model for for-profit firms, who have to earn returns high enough to justify their investment to shareholders. The attendant higher costs associated with making many smaller loans to the poor (as opposed to fewer, larger loans to the wealthy) raises questions about the long-run viability of for-profit MFIs, especially those that do not adopt the group lending model. One approach that for-profit MFIs could take is to focus on the higher-end (i.e., larger loans to the comparatively wealthier households) loans to the poor.

Though few investigations have directly addressed the issue of a non-profit or a for-profit bearing on financial performance and outreach, several studies have been conducted on the type of governance that an MFI should possess (Hartarska, 2005; Mersland and Strom, 2009). In particular Merlsand and Strom through their data of 278 MFIs from 68 countries find that there is no significant relation to a firm being either a non-profit organization or a Shareholder Firm and financial performance and outreach. Others investigate the influence of a MFI's type such as bank, non-bank, cooperative, etc. on profitability, sustainability, and reach (Cull, Demirguc-Kunt and Morduch, 2009). Their results suggest two things:

(a) that the commercialization of microfinance does not hold the same capacity for outreach to the poorest clients, relative to nonprofit outreach and (b) that the typical non-profit MFIs are more financially self-sustainable than for-profit MFIs (Cull et al., 2009). Interestingly, they were also able to observe an increase in the average loan size per borrower as the various intensity of profit-seeking behavior increased (Cull et al., 2009).

In one of the larger studies available to date, Gonzalez and Rosenberg (2006) combined confidential information from The Microcredit Summit Database with data from The MicroBanking Bulletin as well as The Mix Market to produce a dataset of over 2600 microfinance institutions to evaluate impacts on profitability and outreach. The authors find that neither scale nor an MFI's age appear to impact an MFI's profitability, measured by net adjusted returns on assets. They also find that for-profit microfinance is financially viable opportunity to move into competition with others in the investment market. At the same time, Nobel laureate and "microfinance pioneer," Muhammad Yunus is on record as opposing the for-profit movement in microfinance, saying "When you are making profits you are moving into the mentality of the loan shark. We are trying to get that loan shark out" (Burgis, 2008, p 4). Research by Mersland and Strom (2008) and Cull et al. (2009) has different implications for the optimal ownership type for a MFI, though neither investigation provides an empirical consensus for the microfinance industry. The rest of this paper proceeds as follows: Section 2 is a discussion of the hypotheses, Section 3 describes the data, Section 4 contains the results and Section 5 presents our conclusions.

Hypotheses

The motivation for our hypotheses stems largely from the Yunus critique in "Creating a World Without Poverty", in which he considers for-profit MFIs to be problematic and potentially disruptive to the progress made by Grameen and other NGO's in reducing the harmful influence of moneylenders and opening opportunities for the poor. For expository purposes, we assume that the social mission of nonprofit MFIs will have systematically different outcomes when compared to for-profit firms seeking higher returns (even if these assumptions do not necessarily fit with previous empirical investigations). Our hypotheses are as follows:

H_1: Nonprofit MFIs have higher proportion of women borrower

Given that nonprofits more focused on social impact, rather than profitability per se, we would expect non-profits to have a higher proportion of women borrowers. Results from previous investigations (see Armendariz and Morduch, 2005) seem to suggest that women borrowers provide greater social impact than their male counterparts and also tend to have higher repayment rates.

H_2 : Non-profit MFIs make many small loans compared to for-profit

Similar to the discussion for H_1, to the extent that NGOs focus on reaching larger numbers of the poor, we would expect nonprofits to have more loans with smaller average loan size than their for-profit counterparts. Prior research (Cull et al., 2009) suggests that being a non-profit is associated with a greater outreach than a for-profit.

H_3: Nonprofit MFIs have lower margins

Since nonprofit organizations do not have the same profit-maximization motivation than their for-profit counterparts, nonprofits are expected to have lower profit margins than for-profit firms. In general one would expect nonprofits to operate very close to their costs, leaving little room for excess profits.

H_4: Nonprofit MFIs have higher expenses

With their social mission, nonprofits would be expected to provide more services per borrower. In addition, trying to reach as many poor borrowers as possible would likely increase costs for nonprofits. Thus, we would expect nonprofit MFIs to have higher attendant expenses than for-profits.

H_5: Nonprofit MFIs charge lower interest rates

Since they do not have a profit motive, nonprofit MFIs would be expected to charge their clients lower interest rates than for-profit firms. One of the critiques of MFIs is their high interest rates (indeed, this is part of the Yunus critique) so one would expect nonprofit firms (and their boards) to be especially cautious about charging rates that could be perceived as "usurious."

H_6: Nonprofit MFIs have higher proportion of risky loans

Since for-profit MFIs have a greater incentive to avoid making loans to very risky borrowers, we would expect nonprofits to have a higher proportion of risky loans.

Data

We generated a dataset including 460 MFIs from around the world using the Microfinance Information Exchange (MIX) data, which are publically available from the *mixmarket.org* web site. Our data set includes information on the funding source of the MFI (non-profit vs. profit), the country in which the MFI operates, the percent of women borrowers and the loan loss rate of the portfolio. Some of the observations contained missing data for gross yields, as well as loan loss rate and percent of women borrowers. In order to distinguish between for-profit and nonprofit MFIs we focused on the shareholder's capital variable. We assumed that if an MFI was funded with shareholder's capital that it was for-profit; otherwise, it was a nonprofit. Since the precise definition of "nonprofit" may vary from country to country, we believe this method of determining nonprofit status is the best one available. This method also likely avoids "false positives" for for-profit status, but may miss some that were actually for-profit firms but did not have any shareholder's capital. The data set contains more nonprofit MFIs with 272 MFIs reporting that they were funded completely by private and government sources, while 188 reportedly were funded by shareholder's capital.

While the MIX data have been used in other published investigations, one concern is that all the data are self-reported. As noted in Cull et al. (2009), the incentive for for-profit firms to appear better for investors may skew the data to be more ideal—whether through actual adjustments of data or self-selection to the pool. Of course, this could also work the same way for nonprofit firms that wish to demonstrate to potential donors that they are financially viable. We have included descriptive statistics in Table 1. The mean percentage of women borrowers is nearly two-thirds (65.60%), ranging from only 3.35% to a high of 100%. While the mean number of outstanding loans is just under 75,000, the values range from 22 to slightly over 5 million. Profit margins and gross yields also range from negative values to very high positive values. The average loan size is $1,029.81 (values are converted to USD), ranging from an average of just under $50 to over $16,000.

Table 1: Descriptive Statistics

Variable	Means	Std Dev.	Min	Max
Percentage of Women	65.60	26.41	3.35	100.00
Number of Outstanding Loans	74,705.21	418,486.65	22.00	5,163,279.00
Profit Margin	8.97	34.91	-269.11	66.26
Yield on Gross Portfolio (Real)	25.76	16.42	-2.66	120.90
Financial Expense to Assets (Pct)	4.72	3.67	0.00	24.13
Operational Expense to Assets (Pct)	18.12	12.37	1.28	91.94
Cost per Borrower	164.31	285.14	3.00	4,532.00
Portfolio at Risk More Than 90 days (Pct)	4.65	8.03	0.00	65.37
Loan Loss Rate (Pct)	0.94	2.29	-9.72	22.77
Average Loan Size	1,029.81	1,563.64	48.70	16,624.00

Results

In order to test whether there were significant differences between for-profit and nonprofit MFIs along a number of important dimensions, we separated the data by for-profit status and performed a t-test to compare the means for significant differences. Results are presented in Table 2. Columns two and three contain the mean values for nonprofit and for-profit MFIs, respectively. Column four contains the "t" values and values in column five convert the "t" into a probability that the means are identical (i.e., that the difference is zero). In other words, if the value in column five is below 0.10, then the probability that the means are identical is less than 0.10. Stated differently, there is greater than a 90% chance that the means are different from one another.

Based on these results, there are only three variables that are significant or marginally significant. The value for "operational self sufficiency" appears to be significantly higher, but not for for-profit firms as one might expect, but for nonprofit MFIs. Similarly, profit margins were marginally significantly higher for nonprofit firms (11.48 vs. 5.36) and "financial expense to assets" percentages were actually marginally significantly *lower* for nonprofit firms. In other words, where there were significant differences between for-profit and nonprofit MFIs, the results suggest that nonprofit firms were actually more financially sustainable.

In terms of the hypotheses, the results are generally not supportive of the hypotheses. More specifically, we find no support for H_1 (nonprofits have a higher proportion of women borrowers), since the means are not significantly different from one another. While nonprofits do serve slightly more women, there is no significant difference between the two percentages. Regarding H_2 (nonprofits make many small loans compared to for-profits), we have a similar results, namely that nonprofits serve more loans (99,587 compared to 41,143) but this difference does not meet normal thresholds for significance. Similarly, average loan size for nonprofits is slightly smaller ($991 vs. $1,075) but they are not significantly different from one another. In sum, we reject H_1 and H_2.

The results for H_3 (nonprofits have lower profit margins) are actually more dramatic. Not only do nonprofits not have lower profit margins, but they actually seem to have (marginally) significantly higher profit margins and significantly higher operational self-sufficiency (1.23 vs. 1.16). Thus, we have a "strong reject" result for H_3. Results for H_4 (nonprofits have higher expenses) are similar, though not quite as robust. As mentioned above, it appears from our results presented in Table 2 that nonprofits have actually lower "financial expense to asset" percentages (though these are marginally significant at the 10 percent level), not higher. Further, nonprofits do not have significantly higher "operational expense to asset" or "cost to borrower" percentages. In sum, we strongly reject H_3 and H_4.

Table 2: Comparison of Means, t-Test Results

	Means		t-Test	
Variable Description	**Nonprofit**	**For-profit**	**t**	**Prob. Dfc. = 0**
Percentage of Women	66.678	64.34	0.8856	0.3763
Number of Outstanding Loans	99587.06	41143.39	1.4073	0.1601
Gross Loan Portfolio	2.16E+07	1.50E+07	1.0641	0.2878
ROA	2.943	1.7402	1.3742	0.1701
Operational Self Sufficiency	1.2337**	1.1579	2.4393	0.0151
Profit Margin	11.4762*	5.35586	1.8328	0.0675
Yield on Gross Portfolio (Real)	26.5978	24.6316	1.2052	0.2288
Financial Expense to Assets (Pct)	4.4453*	5.1175	-1.8863	0.0599
Operational Expense to Assets (Pct)	18.6756	17.4163	1.0472	0.2956
Cost per Borrower	155.91	175.215	-0.6853	0.4935
Portfolio at Risk More Than 90 days (Pct)	4.4426	4.9065	-0.5804	0.5619
Loan Loss Rate	1.0605	0.769	1.3084	0.1915
Average Loan Size	991.0306	1075.133	-0.5413	0.5886

*** Denotes significance at 1%, ** at 5%, * at 10% level

We turn now to results for H_5 and H_6. The results for H_5 (nonprofits charge lower interest rates) indicate that while nonprofits did have a slightly higher "yield on gross portfolio (real)" (our proxy for interest rates charged) it was not significantly different from the value for for-profits. For H_6 (nonprofits have higher proportion of risky loans), we also find no support. The "loan loss rate" was slightly higher for nonprofits but the "mean proportion of portfolio at risk > 90 days" was slightly lower and neither of these was significantly different. Thus, we reject H_5 and H_6. In sum, each of the hypotheses, phrased in a manner consistent with prevailing beliefs about the differences between nonprofits and for-profits, is rejected by our results. Most of these results are, in fact, consistent with findings from other published reports (see Cull et al., 2009), though they do remain somewhat puzzling given the assumptions about the differences in mission by type and the concerns raised by Yunus about for-profit institutions.

Conclusion

This current endeavor has been an attempt to test six hypotheses about the difference between nonprofit and for-profit types of ownership. Each of these hypotheses was set up to reflect expected differences in mission that are associated with for-profit and nonprofit organizations. Since for-profit firms generally have a profit-driven mission and nonprofits are

assumed to be focused more on service, we find these results (while consistent with many other published papers) to be somewhat enigmatic. In fact, we reject all six of these hypotheses.

We found that there was no significant difference in terms of gender (H_1) or the number of loans and loan size (H_2). Results presented in Table 2 suggest that nonprofits actually seem to have higher profit margins and operational self sufficiency, not lower (H_3). They also appear to have lower financial expense to asset ratios and no significant difference on other "expense" variables (H_4). Results presented here also suggest that nonprofits do not charge lower interest rates than for-profit MFIs (H_5), nor do they have a higher proportion of risky assets (H_6). Overall, nonprofit firms appear to be very similar to for-profit firms, at least along the dimensions for which we had reasonable data for analysis. Where they do differ significantly is in terms of slightly better financial profitability—though not for for-profit firms, but for nonprofit MFIs.

While these results are somewhat counterintuitive, they do fit rather well with previously published results (see Cull et al., 2009). We offer a few caveats and suggestions for interpretation of our results. First, as noted above, there are some concerns about whether this international data set is representative of all international MFIs. There could be a "positive" reporting bias since these are self-reported data and to the extent that nonprofits rely on donor support, MFIs that are not performing well may choose to avoid reporting data to MIX altogether. Further, those that do may have more of an incentive than for-profits to make their financial picture as positive as possible, though one would think that for-profits also need to please their shareholders in order to generate additional financial capital, if necessary. We are also aware that some nonprofit firms may benefit from government subsidies and assistance, which would artificially "inflate" their financial success. We believe further research is needed to identify this particular issue.

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The Reliability and Validity Tests of Knowledge Retention Assessment Instrument for College of Business, Southern University and A&M College, Baton Rouge Louisiana

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Abstract

The College of Business at Southern University and A&M College developed an instrument to assess knowledge retention by its students. The instrument is divided into four subscales: written communication; professional ethics; global knowledge; and critical thinking. The instrument is administered to randomly selected students during fall and spring semesters. Correlation and cluster analyses were used to determine internal consistency and construct validity of the instrument. Results suggested that some question have to be rephrased and the subscales have to be divided into clusters with same construct. This will improve both reliability and validity of the instrument.

Introduction

Outcomes Assessment is an increasingly important factor as employers and legislators demand more direct measures to adequately reflect the level of learning attained by students and to support continuous improvement of the students learning environment. Assessment is thus becoming a valuable tool that improves student learning, while reassuring stakeholders that students are indeed learning what faculty members are teaching. As a response to the ongoing process of understanding and improving student learning, AACSB-International changed its Accreditation Standards in 2003 and placed more emphasis on Learning Outcomes Assessment.

The College of Business at Southern University has designed and implemented a comprehensive assessment plan and process since 2004 to ensure that all the degree programs are capable of meeting AACSB expectations regarding assessment of student learning. This involved identification of learning goals, assessment of the degree of attainment of the desired learning outcomes and feedback to the curriculum for continuous improvement. The assessment planning and processes focused on developing learning goals and objectives and aligning the goals with the curriculum; establishing instruments and methods for assessing student learning; developing the traits and rubrics to assess the students' competencies in selected areas; and developing the feedback loop for evaluating the assessment results and making changes where needed.

During the entire process, the College of Business selected four learning goals. These goals are perceived critical for success in the current business environment. They are: written communication skills; value ethics and professional responsibility; familiarity with global perspective; and critical thinking skills. The learning objectives of written communication skills is to allow students to write well-supported professional documents and reports, employ interpersonal skills to facilitate effective interaction, prepare and deliver a professional speech or presentation using state of the art technology where appropriate. For ethical and professional responsibility, the learning objectives are to allow students to distinguish between ethical/legal and unethical/illegal situations in a business environment and comprehend the concept of social responsibility and be able to behave ethically and with integrity, both individually and as a member of a team.

The third objective of familiarity with global perspective focus on training students to comprehend cross-country cultural differences and how they affect the way people think, solve problems, value work and reward achievement. This is to allow students to identify the social costs and benefits of relevant decisions in the global marketplace/environment and demonstrate awareness and knowledge of global trade and finance as well as the global consequences of resource management and mismanagement. The learning objective of critical thinking skills is to equip student with knowledge and experience that will allow them to identify and define problem statements, seek information and data from a wide variety of sources to provide insightful interpretations for decision-making, and evaluate options, taking into account the advantages and disadvantages of each option, and the consequences of their decisions. Different courses offered in the College are aligned to teach and test these skills.

Based on the goals and objective, an assessment instrument was developed in and has been administered to randomly selected students taking College of Business courses. However, the reliability and validity of this instrument has never been tested. The objectives of this paper are: test the reliability and validity of the instruments, and demonstrate how to use these tests in improving quantitative academic assessment.

Reliability and Validity Tests

By definition, reliability refers to the accuracy and precision or consistency of an assessment instrument (Thorndike 1997). All assessment instruments that use different questions to construct a scale constitute some degree of inconsistency. The inconsistency in a set of questions arises from variation across individuals plus all other sources of variability within and across the instrument's questions. Variability is also made up of true values of the questions and error or noise. For an assessment instrument, reliability measures the ratio of the variability of the true values of the answer to the questions to the sum of variability of the true values of the answer to the questions and associated errors. In general, reliability of an assessment instrument is increased by reducing error variance and by increasing the variance of the true value. Moreover, any an assessment instrument is reliable if there are greater interindividual variations in the sample or population (Johnson 1997).

While there are several measures of reliability, in this study we focused on internal consistency. This measures the extent to which all of the questions in the model were measuring the same construct. Do all the questions tend to move together (same direction) or do some items move to different direction. Internal consistency was measured by the estimated Cronbach's coefficient alpha, which summarizes the average correlation between all possible pairs of questions. In other words, Cronbach's coefficient alpha (α) measures how well an assessment instrument measures a single, unidimensional latent construct. The acceptable value of Cronbach's coefficient alpha (α) depends on the objective of the study. However, the value between 0.6 and 0.8 is commonly accepted.

Validity refers to the extent to which an instrument measures what it intended to assess. There are a variety of ways to evaluate validity. However, in this study, our focus is on construct validity. Construct validity refers to whether an instrument measures or correlates with the theorized assessment construct that it purports to measure (Golafshani 2003). Variable clustering approach through iterative splitting was used to divide the questions from each goal into non-overlapping subscales that represent written communication skills, value ethics and professional responsibility, familiarity with global perspective, and critical thinking skills. This procedure iteratively divides groups of questions into subscales using student's responses. This is to provide a more direct way of creating an instrument that measures the same construct and direction (e.g., easy questions and hard questions).

In summary, reliability refers to the degree to which an assessment instrument is consistent and stable in measuring what it is intended to measure. The instrument is reliable if it is consistent within itself and across time. Validity refers to the degree to which the instrument actually measures what it claims to measure. Validity determines the extent to which inferences, conclusions, and decisions made on the basis of the instrument are appropriate and meaningful. Therefore, validity is a prerequisite to testing for reliability. If a test is not valid, then reliability is also doubtful.

Source of Data and Data Analyses

This study uses the data collected in spring and fall semesters of 2007 and 2008 and spring semester of 2009. A sample of College of Business students were selected randomly from different classes. The assessment instrument was administered to the sampled students using Blackboard. For each semester, at least 200 students were interviewed. Ten multiple choice question were designed to test the students on written communication skills; value ethics and professional responsibility; familiarity with global perspective; and critical thinking skills. To test for reliability and validity of the assessment instrument, the student's scores were collapsed to a dichotomous variable (i.e., correct answer=1; and zero otherwise).

The analysis was conducted using CORR and VARCLUS procedure in the SAS system. The CORR procedure was used to estimate Cronbach's coefficient alpha. PROC CORR with alpha option computes two types of coefficients using raw and standardized values (scaling the variables to a unit variance of 1). In each step, the procedure computes the correlation between any response to a single question with the remaining responses and the corresponding Cronbach's coefficient alpha. The raw responses to the questions were used instead of the standardized responses since there was no mixture of dichotomous and multi-point scales in the data. Standardized Cronbach's coefficient alpha is used when heterogeneous variances is expected.

The VARCLUS procedure was used to find group of questions that are highly correlated as well as group of questions that are highly uncorrelated. The procedure is closely related to principal component analysis and is commonly used as an alternative method for eliminating redundant dimensions. By default, VARCLUS procedure begins with all responses in a subscale as a single cluster. It then repeats the following steps. First, a cluster is chosen for splitting. Depending on the options specified, the selected cluster has either the smallest percentage of variation explained by its cluster component or the largest eigenvalue associated with the second principal component. Second, the chosen cluster is split into two clusters. This is achieved by finding the first two principal components by performing an orthoblique rotation (raw quartimax rotation on the eigenvectors). Each question is then assigned to the rotated component with which it has the higher squared correlation

In the final steps, the questions are iteratively reassigned to clusters to maximize the variance accounted for by the cluster components. The reassignment may be required to maintain a hierarchical structure (SAS 1999).

Results and Discussion

Results of both correlation and cluster analyses are presented in Table 1. The first two columns present the suggested numbers of clusters by skills and the estimated Cronbach's alpha coefficients (before and after clustering the questions). Before splitting the questions into clusters, the coefficients ranged from 0.15 (Oral communication) to 0.56 (for global perspective). After clustering the variables, the estimated Cronbach's alpha coefficients increased from 0.32 (cluster 3, oral commutation) to 0.81 (cluster 3, critical thinking). Cronbach's coefficient alpha will generally increase as the intercorrelations among questions increase (Gouttebarge 2004). Increase in Cronbach's coefficient alpha also indicates increase in internal consistency of the questions. This is because intercorrelations among questions are maximized when all questions measure the same construct. This is because the Cronbach's coefficient alpha indicates the degree to which a set of questions measure a single one-dimensional latent construct. A set of questions is highly reliable when the estimated Cronbach's coefficient alpha is high.

Table 1: Results on Reliability and Validity of the Assessment Instrument

Learning Goals	Cluster	Cronbach's Coefficient alpha (α)	Questions in Clusters	Proportion of Variation Explained Variance	Second Eigenvalue
Critical Thinking		0.29	all	0.466	
	1	0.55	Q2, Q3, Q5	0.147	0.938
	2	0.73	Q6, Q7	0.267	0.819
	3	0.51	Q8, Q9, Q10	0.368	0.996
	4	0.43	Q1, Q4	0.466	0.810
Ethics and Professional Responsibility		0.46	all	0.389	
	1	0.78	Q2, Q3, Q4, Q6, Q8, Q9	0.190	0.977
	2	0.58	Q1,Q7, Q10	0.291	0.966
	3	na	Q5	0.389	na
Global Perspective		0.56	all	0.312	
	1	0.65	Q1, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10	0.206	0.967
	2	0.72	Q2, Q10	0.312	0.850
Written Communication		0.12	all	0.501	
	1	0.51	Q2, Q3, Q7, Q8	0.153	0.990
	2	0.82	Q6, Q9	0.276	0.872
	3	0.32	Q4, Q5	0.392	0.943
	4	na	Q1	0.501	na

Note: Questions asked are available on request.

In Table 1, the last three columns give the suggested questions in each cluster, the total variation explained by the clusters, and the second Eigenvalue. Using critical thinking as an example, cumulative proportion of variation explained by all questions in the four clusters is 0.466. Question two, three, and five explained the proportion of variation of 0.147. When the number of clusters is two, the cumulative proportion of variation explained by questions in cluster one and two is 0.267.

The proportion of explained variance increases to 0.368 when the critical thinking questions are split into three clusters. When four clusters are computed, the cumulative explained variation is 0.466. Therefore, cumulative proportion of variation explained by all questions in the ethics and professional responsibility is 0.389. For global perspective and oral communication is 0.312 and 0.501, respectively. The second eigenvalue column indicates if clustering was successful. The value of less than one show that clustering is fully implemented and the cluster cannot be split further.

Based on the estimated Cronbach's coefficient alpha and proportion of variation explained by the questions before and after clustering, it is obvious that the instruments needs some improvement in terms of deciding what to measure, deciding how to measure and deciding how to present the feedback. The first step can be achieved by determining important elements of each learning goal. Each goal can be segmented into its components and the questions redesigned to assess these components. The questions in each cluster could serve as building blocks in designing new questions. This will allow writing questions that represent attributes associated with each learning goal and developing assessment scale.

Deleting the questions will low intercorrelation across other questions or deleting clusters with low Cronbach's coefficient alpha will not improve the instrument. Table 2 presents the results on potential increase in Cronbach's coefficient alpha after deleting the question from the learning goal.

Table 2: Cronbach Coefficient Alpha with Deleted Questions

Subscale	Deleted Variable	Correlation With Total	Alpha
Critical Thinking	Q1	0.09	0.274
	Q2	0.09	0.270
	Q3	0.14	0.246
	Q4	0.19	0.221
	Q5	0.14	0.246
	Q6	0.12	0.256
	Q7	0.14	0.249
	Q8	0.09	0.274
	Q9	0.07	0.284
	Q10	-0.05	0.335
Ethics and Professional Responsibility	Q1	0.04	0.490
	Q2	0.17	0.438
	Q3	0.31	0.403
	Q4	0.31	0.389
	Q5	0.10	0.458
	Q6	0.22	0.423
	Q7	0.11	0.464
	Q8	0.32	0.389
	Q9	0.21	0.425
	Q10	0.13	0.451
Global Perspective	Q1	0.14	0.558
	Q2	0.33	0.504
	Q3	0.32	0.511
	Q4	0.29	0.517
	Q5	0.21	0.538
	Q6	0.18	0.545
	Q7	0.25	0.527
	Q8	0.18	0.546
	Q9	0.21	0.539
	Q10	0.32	0.509
Written Communication	Q1	-0.04	0.216
	Q2	0.05	0.147
	Q3	0.12	0.110
	Q4	0.03	0.161
	Q5	0.00	0.176
	Q6	0.10	0.011
	Q7	0.14	0.087
	Q8	0.18	0.097
	Q9	-0.03	0.018
	Q10	-0.01	0.161

For example, if question one were to be deleted from the critical thinking learning goal, then the value of Cronbach's coefficient alpha will decrease from 0.29 (Table 1) to 0.27 (Table 2). This means that the removal of question one from the critical thinking scale will not make the instrument more reliable. In addition, in all cases, note the low values of total intercorrelation among question items (Table 2). This indicates that most of the questions are not measuring the same construct as expected.

The results in Tables 1and 2 can be also linked to the student test scores. As shown in Table 3, high scores are related to high value of the questions' intercorrelation measure and high value of Cronbach's coefficient alpha. Evaluators can use this information to improve the instrument and identify the instrument's major weakness. Using written communication learning goal as an example, the estimated Cronbach's coefficient alpha is low compared to other goals (Table 1). However, there are improvements when the questions are split into four clusters. After clustering, the estimated Cronbach's coefficient alpha for cluster 2 is the highest (0.82) across the all learning goals. Deletion of questions six and nine that constitute cluster 2, will highly affect the instrument (Table 2). Notice that the same cluster is also associated with high percentage in terms of correct answers given by the students within the communication skill test (Table 3). Question tens seems to stand alone as only few students (12%) gave correctly answers. The assessment team can look at these contrasts and identify the causes and rectify the weakness of instrument.

Conclusion

The goal of developing any academic assessment instrument is to carefully measure specific skills in way that will produce meaningful and useful results. Reliability and validity tests are equally important in determining the usefulness of the instrument especially when the instrument is intended to be used for predictive analyses. If the instrument shows poor reliability, then individual questions within the instrument must be re-examined and modified or completely changed to improve the validity of the assessment. It is very important to establish that whether the same set of questions would elicit the same responses if the same questions are recast and re-administered to the same or homogenous students. The instrument is reliable and valid only when it provides stable responses over time. We use CORR and VARCLUS procedures available in the SAS system to assess the reliability and validity of the assessment instrument used by the College of Business at Southern University and A&M College. The Cronbach's coefficient alpha is used to indicate internal consistency or average correlation of questions in the instrument to gauge its reliability. Clustering techniques available in VARCLUS procedure were used to group questions that measure the same construct (construct validity).

The main results indicate that the instruments need some improvement. The identified four learning goals of written communication skills; value ethics and professional responsibility; and familiarity with global perspective; and critical thinking skills should be segmented into different subscales that measure the same construct. It is suggested that written

communication learning goal should be divided into four subscale, value ethics and professional responsibility three subscales and familiarity with global perspective into two subscales; and critical thinking skill into four subscales, respectively. Apart from improving the reliability and validity of the instrument, it will help in developing the reliable quantitative measurement scale for each learning goal. The building blocks of each subscale would be the questions in the identified clusters. Moreover, a follow-up study is needed to link the reliability and validity test and clustering results to demographic characteristics of individual students who participated in the study. This would help to identify weakness and needs of students, to link strategies towards achieving the College of Business learning goals, and to close the loop.

Table 3: Proportion of Students with Correct Answer

Learning Goals	Clusters	Mean Proportion
Critical Thinking	All	0.44
	1	0.31
	2	0.74
	3	0.44
	4	0.31
Ethics and Professional Responsibility	All	0.56
	1	0.71
	2	0.40
	3	0.11
Global Perspective	All	0.40
	1	0.62
	2	O.62
Written Communication	All	O.67
	1	O.41
	2	0.70
	3	0.21
	4	0.12

The sample size was 633 per each learning goal

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Speculating on the Price of Oil

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Abstract

In this article we investigate the impact of speculative and real factors on the price of oil during the run up of oil prices during 2008. For real factors we use the price of the dollar against various baskets of currencies since the price of oil is denominated in dollars. We also use oil supply, oil demand, and excess oil demand to measure the impact of real factors on the price of oil. For speculative factors we look at participation in oil futures by speculators to measure the impact of speculation in oil prices. Our results indicate that the price of oil is negatively related to price of the dollar. The other factors were insignificant.

Introduction

There is some controversy about whether oil prices are determined by underlying "real" factors of supply and demand or whether speculation plays a role in determining oil prices. This paper seeks to determine empirically the extent to which speculation influences oil prices by using a model which incorporates both real and financial variables. Specifically, the model incorporates global and US GDP to measure demand factors as well as oil demand and oil supply figures to provide the basic supply and demand fundamentals. Additionally the dollar valued in a weighted basket of currencies is used since the world market for oil is priced in dollars. To determine the role of speculation in oil pricing we evaluate the presence of speculative investors in the oil futures market. The huge increase in the price of oil last summer to the $150 a barrel range alarmed policy-makers who were concerned about the impact of high oil prices on the economy. Could it be that speculators on Wall Street, rather than economic fundamentals, were driving this increase? If speculators were in fact the primary contributors to the oil price increase then public policy measures should be considered to lessen the adverse effects on economic activity.

Demand

The key driver of oil demand has been robust global economic growth, averaging close to 5% per year since 2004 (ITF Interim Report on Crude Oil, July 2008). China, India, and the Middle East use substantially more oil to produce a dollar's worth of real output than the United States, and they are among the fastest growing economies in the world, accounting for nearly two thirds of the rise in world oil consumption since 2004 (ITF Interim Report). Moderate growth rates in the large industrial countries (United States, the European Union, the United Kingdom, and Japan) during the 2004-2006 period contributed to the 5% global growth rate but recessions in the latter part of 2007 and 2008 kept the global growth rate from rising much further. Nevertheless, long term projections of the demand for oil depend critically on assumptions about the future of emerging Asia – its substantial population, the convergence of its real per capita income to the level of OECD countries, the use of motor vehicles, and the shift of production to goods requiring a more technologically advanced (and presumably energy-dependent) capital stock (IMF Staff Papers, Vol. 55, No. 2; p.306).

Since the demand for oil is relatively inelastic, even small changes in the supply of oil cause large movements in oil prices. Given also that the supply of oil is relatively inelastic in the short run,, changes in either (or both) supply or demand give rise to highly volatile movements in the price of oil. In another section of this paper we will see how this oil price volatility is fertile ground for speculators. This price volatility is exaggerated by the inelasticity of demand and supply and creates political pressure on the governments of oil consuming countries to deal with these oil shocks.

There are a variety of factors that determine the total demand for oil. Oil is a necessary input factor of production in many businesses both directly and indirectly. Governments of nations maintain strategic oil reserves and changes in those reserves will impact the demand for oil. Jaffe and Soligo (2002) discuss the importance of oil as strategic reserve that is essential in time of war. Reserves can be used a buffer between unsynchronized demand and supply for oil. Inventories can also be held for speculative purposes. Due to deregulation companies have reduced inventories leading to greater price volatility which can have negative consequences for productivity growth.

Hamilton (1983) found that an increase in oil prices leads to a decline in GNP growth. His study focused on the pre-1973 period which was a period of generally increasing oil prices. Mork (1989) extends Hamilton by including periods of declining prices and finds that Hamilton's results persist in periods of oil price declines as well. Mork (1989) demonstrates an asymmetric reaction to oil price increases and oil price decreases. The correlation between change in GNP to price decrease oil is significantly less than price increases or nonexistent.

Supply

According to the Energy Information Administration the world supply of oil from 2004 through 2007 has remained remarkably stable at about 84,000 thousand barrels a day, rising to 85,000 in 2008, and subsequently dropping to 83,000 in 2009. Looking at world oil supply during the 2004-2009 period one might expect oil prices to remain relatively stable during the 2004-2007 period, falling during the year 2008, and rising again in 2009. These supply figures do support the fact that oil prices peaked in the summer of 2008 and subsequently fell in 2009, leading one to suspect that demand factors were more important in determining oil prices during these periods. Over these same periods, OPEC produces an average of 34,000 (2004-2007), rising to 35,000 in 2008, and dropping to 33,000 in 2009. The U.S. by contrast produced an average of 8,000 during each of the three periods. (Energy Information Administration/International Petroleum Monthly October, 2009).

Dollar

The relationship between oil prices and the dollar is complex. An excellent discussion of the issues appears in a New York Times article by Steve Hawkes (2007). One of the issues is the causality question and the other is the correlation question. In most cases there is a negative correlation between changes in the value of the dollar and changes in oil prices, though under certain circumstances the correlation could be positive. The negative correlation between changes in oil prices and changes in the value of the dollar is based on the fact that since oil is globally priced in dollars, a depreciation of the dollar reduces the price of oil for buyers with currencies other than the dollar, thus increasing the demand for oil and driving up the dollar price of oil. Thus large oil consumers like the Euro bloc, China, and Japan would find oil at bargain prices if the dollar depreciated with respect to these currencies. In addition oil producers have the incentive to raise the dollar price of oil when the dollar depreciates in order to maintain the real value of a barrel of oil. In other words if oil producers would like to see a higher price for oil they would cut back on production and drive the dollar price up. A positive correlation and causality going from oil prices to the dollar may occur when the U.S. economy's growth rate begins to strengthen and inflation begins to rise. If the price of oil is rising as world demand strengthens and the Fed raises interest rates this will increase the demand for dollars and result in a dollar appreciation. Alternatively, if we assume an increase in oil prices increases the trade deficit due to an increase in our import bill this may lead to a depreciation of the dollar. In both these cases the causality goes from oil prices to the dollar, but in one case the correlation is positive and in the other it is negative.

Oil Futures

Futures are financial derivatives whose value is derived from the value of the underlying asset. Futures are traded on oil. There are several different types of oil futures traded in the global market place. Bent Crude is the biggest of the many major classifications of oil and is sourced from the North Sea. It is used to price two thirds of the world's internationally traded crude oil supplies. The other well-known classifications are the OPEC Reference Basket, Dubai Crude and West Texas Intermediate (WTI). West Texas Intermediate is the type of crude oil used as a benchmark in oil pricing and the underlying commodity of New York Mercantile Exchange's oil futures contracts. It is often referenced in North American news reports about oil prices, alongside North Sea Brent Crude. Dubai Crude is used as a price benchmark or oil marker because it is one of only a few Persian Gulf crude oils available immediately and is generally used for pricing Persian Gulf crude oil exports to Asia. The OPEC Reference Basket (ORB), also referred to as the OPEC Basket is a weighted average of prices for petroleum. Recent articles have examined the impact of speculators on oil prices (Medlock and Jaffe 2009). They find that the increased participation of speculators in the oil futures coincided with the run up in oil prices in 2008. Futures can be used to hedge against or speculate on changes in oil prices. Parties with physical supplies of oil or demand for oil can use futures to mitigate the impact of changing oil prices to their financial statements. These parties want to reduce an exposure to risk. For a market for the exchange of risk to exist there must be a counterparty that is willing to assume the risk. Here is where the speculators enter the market. The Commodities Futures Exchange Commission (CFTC) defines noncommercial traders as traders who are not using futures to hedge and commercial traders as those using futures to hedge an existing exposure to the underlying asset. The Commodities Futures Exchange Commission formed an Interagency Task Force on Commodity Markets (ITF) in June of 2008 to assess the fundamental factors affecting the crude oil market between January 2003 and June 2008. The ITF prepared an Interim Report on Crude Oil in July of 2008. They found that the increase in oil prices were due to fundamental supply factors. They also found increased activity in the crude oil futures market but concluded that speculative activity did not influence oil prices.

Data

Data for this article was collected from various sources. The St. Louis Branch of the Federal Reserve computes the value of the dollar against an index of currencies of its trading parties. The exchange rate index a geometrically weighted average of bilateral exchange rates with weights based on international trade (Loretan 2005). They provide a broad based index including 26 currencies which account for more than ninety percent of total foreign trade. The trade weighted index of these twenty six currencies is called our broad index. Seven of those currencies have extensive influence in global currency markets. These currencies are the euro, Canadian dollar, Japanese yen, British pound, Swiss franc, Swedish krona and Australian dollar. Since these currencies trade in liquid financial markets they can be used to create an index to gauge the financial market pressures on the dollar. When the dollar depreciates relative to these seven currencies one would expect the demand for oil by these seven countries to rise as oil prices are effectively reduced when converted to their currencies. The trade weighted index based of the seven major currencies is called our major index. The trade weighted index of the other nineteen currencies is called our other index. We use these three trade weighted indexes to measure the impact of the price of the dollar on the price of a barrel of oil.

GDP data was gathered from OECD Stat which collects quarterly GDP data for OECD countries and selected nonmember countries. The countries for which data is available are as follows: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States. To proxy for global GDP we sum the GDP of the listed countries. GDP is used to proxy for oil demand. Another proxy we use for oil demand was oil imports. We assume that as demand for oil increases that countries would import more oil. Data on oil imports for the United States was collected from the Energy Information Agency. They provide monthly data daily oil consumption of United States, Japan, and Europe daily oil consumption to proxy for oil demand in those regions. Chinese oil demand data is collected from the APEC Energy working group which provides monthly data for Chinese oil consumption. The sum of the consumption from Europe, Japan, China, and the United States is used to proxy for Global oil demand

Oil supply data was gathered from the Energy Information Agency. They provide monthly data for daily crude oil production for the United States, Persian Gulf, OPEC, OPEAC, and the World. The Persian Gulf countries include Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates. OAPEC is the Organization of Arab Petroleum Exporting Countries which consists of Algeria, Bahrain, Egypt, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Tunisia. OPEC is the Organization of Petroleum Exporting Countries which consists of Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria Qatar, Saudi Arabia, The United Arab Emirates, and Venezuela.

The price of oil was collected from the Energy Information Agency. They provide monthly data for the average spot rate for Brent Sea crude oil and for West Texas Intermediate crude oil. Data on the participants in the oil futures market is provided by the Chicago Futures Exchange Commission. We collected monthly data for long and short positions by both commercial and noncommercial customers as well as the spread data for noncommercial customers. Noncommercial customers are not using futures to hedge the impact of oil prices on their financial statements and are assumed to be speculators in the oil market.

Methodology

We begin our investigation with univariate regressions on several factor thought to impact the price of oil. Our first series of univariate regressions use West Texas Intermediate (WTI) spot rates as the dependent variable. We also used Brent Sea (BS) spot rates and found qualitatively similar results. We began with GDP as proxy for oil demand. We used U.S. GDP and global GDP to proxy for oil demand. We found the coefficients positive and significant consistent with the price being positively related to oil demand as proxied by GDP. Next we investigate the relationship between the price of the dollar and the price of oil. We found the coefficients negative and significant consistent with the price oil being inversely related to the price of the dollar. Next we use oil consumption by the U.S., Europe, Japan, and China to proxy demand. The Chinese oil consumption is the only variable that had the expected positive and the only significant at the one percent level. Next we looked at participation in the futures markets by speculators impact on the spot price of crude oil. We looked at long positions, short positions and the spread. All three variable are significant at the one percent level consistent with increased activity by speculators increasing the price of oil.

Table 1: Univariate Results

Independent Variable	Coefficient	T-statistic	Adjusted R-squared
Global GDP	0.751	9.095***	0.557
U.S. GDP	0.679	7.567***	0.453
U.S. Dollar Broad Index	-0.878	-16.795***	0.803
U.S. Dollar Major Index	-0.833	-12.401***	0.689
U.S. Dollar Other index	-0.915	-18.742***	0.835
U.S. Oil Consumption	-0.227	-1.881*	0.037
Japan Oil Consumption	-0.289	-2.433**	0.069
Europe Oil Consumption	-0.031	-0.251	0.001
Chinese Oil Consumption	0.454	4.168***	0.194
Long Speculators	0.616	6.40***	0.370
Short Speculators	0.569	5.668***	0.314
Spread Speculators	0.752	9.342***	0.559

Table 1 provides standardized coefficients, t-statistics, and Adjusted R-squared for univariate regressions on West Texas Intermediate spot rates. *, **,*** represent significance at the 10%, 5%, and 1% level respectively.

Conclusions

Our preliminary results indicate that both real factors and speculative factors impact the price of oil. Our future plans are to conduct multivariate tests to see the relative impact of these factors on the price of oil once we control for the other variables. Our proxies for supply, demand, and speculation require further refinement to remove noise from the measures. We also plan to expand the speculative factors and dollar data to daily values instead of monthly values to further investigate the impact of speculation and dollar price on the price of oil.

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Fiscal Guidance: The Past Compared to the 2009-10 Federal Government Economic Bailout

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Abstract

Under the ARRA of 2009 the Obama administration has incurred a 1.6 trillion budget deficit in FY 2009 with an additional annual $1 trillion deficit through 2019. In turn the national debt is forecast to be $19 trillion, or 77% of GDP, in ten years. This paper reviews the budget policies of America's presidents from Washington to Hoover noting the common thread of minimal federal government spending with low taxes, balancing the budget, and paying off the national debt. The paper notes that this massive deficit and ballooning debt will undermine global confidence in the dollar, place the "AAA" rating of U.S. treasuries in jeopardy, and massive inflation. This study recommends looking to presidential predecessors for fiscal policy guidance.

Introduction

AIG; Citigroup; GM; TARP: these are acronyms and abbreviations that elicit thoughts of outrageous financial machinations coupled with egregious greed generating hastily and ludicrously designed bailout plans created by legislative lunatics. By passing the American Recovery and Reinvestment Act (ARRA) in February, 2009, euphemistically named "the economic stimulus plan", the Obama administration and the democratically controlled Congress has earmarked $787 billion of taxpayer money to rescue firms that range from insolvent banks to bankrupt auto manufacturers. All this has happened with the distant hope of making these entities once again economically sound and productively efficient based upon the premise that they are "too big to fail" (Acharya and Richardson 2009).

In direct consequence, according to statistics provided by the Congressional Budget Office (CBO 2009), the fiscal year (FY) 2009 federal budget deficit almost quadrupled from that of FY 2008, rising from $459 billion during the last Bush year to a shattering $1.65 trillion at the end of the first Obama one. To place in further perspective, federal expenditures exceeded revenues in FY 08 by 3.2% of America's GDP; by the end of FY 09 the deficit will stand at 13.1% of U.S. production of final goods and services. Furthermore, the CBO forecasts that unless a marked reduction in federal expenditures and/or a substantial increase in taxes occurs, the federal government will consistently run annual deficits of more than one trillion dollars through 2019 with accumulated debt by that time equaling more than $19 trillion (the reason that the deficits stop in that year is that CBO predictions only run until then). Pursuant to this budgetary profligacy an additional digit had to be placed on the national debt clock off Times Square in New York when this figure exceeded $10 trillion. At the end of quarter two in 2009, America's gross national debt totaled $10.565 trillion, or approximately $47,000 per U.S. citizen; by 2019 that latter figure may almost double to $81,000. To place in further perspective, the federal debt was 41% of GDP at the end of 2008; by 2019 that figure is predicted to rise to 77%. As Spalding (2009) notes, if federal spending continues at this projected rate, the United States will accumulate more debt in the next ten years then the combined debt summed up over the course of all previous American history.

Ironically President Obama summed up this financial catastrophe in a speech given on June 9th, 2009 when stating: "Paying for what you spend is basic common sense. Perhaps that's why here in Washington, it's been so elusive" (quoted in Economist, June 13, 2009). His reference to basic financial logic notwithstanding, never in the history of the republic has so much public debt been so lauded by so many, and that includes the President, the majority of Congress, and even the Fed. One can ponder if "common sense" in the realm of public budgeting has gone the way of the typewriter: an antiquated curiosity but irrelevant for today.

The object of this paper is to juxtapose the time honored, but recently disregarded, historical American practice of niggardly spending and taxing by the federal government to the budget philosophy and policy endeared by the majority of presidents who preceded Franklin D. Roosevelt. The next section begins with an overview of these concepts during the American Colonial and Revolutionary War periods, albeit fragmented in nature as it was during this time. Then the federal expenditure and taxation operations implemented by U.S. presidents from 1789 to 1932 follow with an emphasis on a common thread running through this 143 year timeframe, i.e., keep the central government at a minimum, maintain low taxes, repay the national debt, and let the economy operate on its own accord. Indeed some executive leaders strayed from these directives, sometimes due to exigencies such as the Civil War under Lincoln and WWI under Wilson, sometimes for perceived societal improvements as under Teddy Roosevelt's Progressive Era programs, sometimes under an economic crisis such as faced by Hoover during the start of the Great Depression. However, none of these exceptional times produced

anywhere near the size of federal government outlays or its budget deficit relative to GDP as witnessed today under the ARRA. And the overarching result of this common set of spending and taxation policies in the past was to allow the United States to strive from its starting point as a former colony to a dominant political and economic position in the global arena, which is being inexorably undermined by this amassing national debt. This latter point will be elaborated upon in this study.

The paper concludes with the recommendation that the present administration should look back at its predecessors for fiscal guidance and, more importantly, to avoid the potential economic calamity that this ballooning deficit and national debt is likely to generate, such as massive domestic inflation. In addition, the possibility of a global downgrading of U.S. Treasuries arises which is already being seen is various parts of the world financial system.

Budgetary Practices of the Colonial and Revolutionary War Eras

The colonial period from the late 1600s to 1775 saw American political values vortex upon an opposition to a large central government (King 1974). In general, the colonists wanted British protection from foreign enemies but little to no internal British rule. If governors and other official administrators appointed by the King or Parliament had to be tolerated, then the general consensus which developed was that any collected tax revenues were to be used to cover immediate expenditures under a process of earmarking (Bullock 1897). Dewey (1939) noted that this belief in balanced government budgets began to take on moral tones. For example the Puritans who colonized New England condemned any sort of debt as a violation of one of God's laws, especially if originating from any level of government.

Several colonial legislatures actually went so far as to elect independent treasurers which then precluded governors and their appointees from controlling their own expenditures. In addition, explicit legislative consent was required prior to any disbursement of tax revenues. Colonial tax receipts were routinely kept segregated by citizens of a locale voting for taxes usable for precise and narrow purposes. As Plehn (1896) in an early text on Public Finance states, during colonial times "public monies could be spent for no other purpose whatsoever" than that upon which it received voter approval.

These almost ubiquitous restrictions led the Crown to seek independent sources of revenue for English governors in the American colonies. The notorious Stamp Act of 1765 which taxed legal documents, newspapers, pamphlets, and even playing cards, the import duties on tea which culminated in the infamous Boston Tea Party of 1773 when patriots likely led by Samuel Adams boarded an East India ship and offloaded tea into the harbor, and the myriad other impositions placed upon the American colonists were the direct results (Bernstein 2008). Bullock (1897, p. 218) encapsulates this British reaction in the following manner:

> "Not a single shilling could be withdrawn from the treasury, but by [colonial] legislative consent. This was particularly galling to the governor. It stripped him of that executive patronage and influence, which was deemed by him so essential to the support of his administration".

This issue of who should rule in America led to the outbreak of hostilities against the British in 1775 and the issuance of the Declaration of Independence a year later in Philadelphia.

The philosophy and practice of keeping the government's budget for non-war related expenditures in balance with earmarked tax revenues carried into the 1775-1781 period of war with England (Myers 1970). On the other hand, financing the Revolutionary War was problematic and tax receipts for this effort were both inadequate and chaotic in collection. The Continental Congress responded by printing copious quantities of paper money to such an extent that by the cessation of hostilities it had depreciated in purchasing power to almost nothing as a result of hyper inflation for goods priced in this medium. Thus the phrase "not worth a continental" came to represent worthless currency (Schultz and Caine 1937).

Robert Morris, one of the signers of the Declaration of Independence, was charged by General Washington to secure funds for the payment of his troops. Due to the depreciated value of Continental dollars Moore was instructed to obtain money by any means in either specie or foreign currency as quickly as possible. In turn, Moore issued a draft on Benjamin Franklin who had been sent to France to obtain funds and military support from the court of Louis XVI. It was cashed at a discount in Philadelphia and then sent in a circumnavigated fashion first to Cuba, then to Madrid, and finally to Paris for collection. Ultimately it was "Poor Richard's" task to secure payment on the bill when it reached Versailles (Grayson 1932). As irony often peppers history, due to poor speculation in land, Morris ended his days in a Philadelphia debtor's prison.

With the cessation of hostilities in 1781, the Continental Congress was replaced by the Articles of Confederation. Eight years later the U.S. Constitution was written and ratified by the thirteen original states. However the economic impact of the monetized deficit spending on prices that occurred during the period of bellicose activity through the time of the Constitutional Convention was incorporated into the spirit of the document. Bolles (1879, p. 201) quotes a statement found in a 1789 *Pennsylvania Packet* newssheet that summed up the problem when referring to inflation as an impediment to prosperity:

> "[T]he natural unavoidable tax of depreciation [in money's purchasing power] is the most certain, expeditious, and equal tax that could be devised. Upon the scale which has lately existed, every possessor of money [i.e., Continental dollars] has paid a tax for it, in proportion to the time he held it".

The new Constitution, while providing the central government with ample authority to impose a wide array of taxes upon its citizens,, both indirect and direct in nature, does suggest achieving the objective of a balanced budget, the need for overall parsimony in government expenditures, and a desire to pay off the accumulated public debt in an expeditious manner (Huntington 1969). It is worth quoting at length a statement made by Pelatiah Webster, a wealthy Philadelphia businessman and patriot imprisoned by the British, taken from his 1791 pamphlet entitled *Political Essays on the Nature and Operations of Money, Public Finances, and Other Subjects"* (p. 145):

> "[T]axation equal to public expenditures is, in my opinion, the only method in nature by which our defence [sic] can be continued, our independence be preserved, *a destructive increase in public debt be avoided, our currency (hard or paper) be kept in a state of fixed value, ...*, the morality of our people be revived, and the blessings of heaven be secured to ourselves and our prosperity". (Italics added).

Apparently the juxtaposition of morality that originated with the Puritans and the goals of balancing government budgets, minimizing public debt, and preserving money's purchasing power, continued to be prized in the new republic. Webster further argued that all government expenditures should be financed only from taxes and not from issuing debt.

In a letter to John Taylor from Thomas Jefferson, cited in Liecester (1904, p. 481), the budget philosophy that would come to dominate federal government expenditure and taxation practices from its beginning to the Great Depression can be found:

> "I wish it were possible to obtain a single amendment to our constitution. I would be willing to depend on that alone for the reduction of the administration of our government to the genuine principles of it's [sic] constitution; I mean an additional article, *taking from the federal government the power of borrowing"*. (Italics added).

The foundation of public finance that presidents from Washington to Hoover espoused were firmly established by the time America's first executive was sworn into office on April 30, 1789. This paper now evaluates the next century and one-half of U.S. political and budgetary history.

Presidential Budgetary Philosophy and Practice from Washington to Hoover

Within thirty days of Washington's inauguration on April 30, 1789, Congress enacted legislation which implemented custom's duties and the ways and means to collect the revenue (Kimmel 1959). One year later, in 1790, Secretary of the Treasury Alexander Hamilton vehemently argued in Congress to fund all government programs with revenues "...provided for this purpose and to pay back the public debt at par value". The concurrence of public faith with social credit then became the foundation of federal budgetary policy (Forsythe 1977). While falling short of repaying the new republic's national debt, by the time Washington left office eight years later current expenditures were only slightly above tax revenues, albeit funding now coming not only from tariffs but also from internal taxes such as the one on whiskey. He noted his "almost" balanced budget in his departure speech of March 4th, 1797 (Lillback 2009).

Washington's successor, John Adams, who served as president from 1797-1801 (henceforth presidential terms in office will be placed in parenthesis), succeeded in raising customs duties during his one term in office while allowing federal expenditures to grow by only about 9% above that of the last Washington budget. In addition, the national debt was further paid down so that in 1801 it was approximately 35% of what Washington inherited in 1789 (McCullogh 2001).

Thomas Jefferson (1801-1809) placed severe limitations on the ability of the executive branch to exercise its spending authority. To this president parsimony and economy in government budgets were the keys. He viewed balancing the budget and the total repayment of the national debt, which in his administration included the addition of the amount incurred by the thirteen colonies during the Revolutionary War along with that of the Continental Congress, as a moral necessity. To quote from a speech made to Congress in 1803 cited in Kimmel (1959, p. 14):

> "I place economy among the first and most important of republican values and public debt as the greatest of the dangers to be feared...I am for government rigorously frugal and simple, applying all savings of public revenue to the discharge of the national debt".

As the quote from Jefferson cited in the previous section noted, he believed that a balanced budget requirement should be enshrined in a Constitutional amendment so as to wipe out the "moral cankor" of public debt (Koch and Peden 1998). Working closely with his Secretary of the Treasury, Albert Gallatin, Jefferson succeeded in repaying almost 70% of the expanded national debt despite repealing many of the internal taxes passed by Washington and Adams and spending 15 million dollars to acquire the Louisiana Purchase from Napoleon in 1803.

The War of 1812 temporarily overturned the objective of balancing the budget during the first administration of James Madison (1809-1817). Initially war expenses were to be financed by issuing new debt instruments, but due to the disruption in international commerce and the resulting reduction in custom's duties, internal excise taxes were imposed on a wide array of goods from foodstuffs to horses and carriages. When hostilities ended in 1815 Madison quickly rejuvenated the budget philosophy of his predecessors. In fact he wanted his tenure in office "to liberate the public revenues by an honorable discharge of public debt (Forsythe 1977, p. 60).

Madison's next two successors, James Monroe (1817-1825) and John Quincy Adams (1825-1829) both maintained the desire to balance taxes with expenditures by markedly increasing custom's duties. Both considered this goal the premier maxim of political economy and "the highest responsibility of a nation's government", thus revitalizing its moral overtone" (Kimmel 1959).

It was Andrew Jackson (1829-1837) as leader of the new Democratic Party that made debt reduction an actual patriotic duty. To quote from one of his speeches (American Heritage 2009, pp. 3-4):

> "We should thus exhibit the rare example of a great nation, abounding in all the means of happiness and security, *altogether free from debt*... [an] unprecedented spectacle presented to the world" (Italics added).

Martin van Buren (1837-1841) reinforced this point in his last annual message to Congress when stating that any budget surplus would foster "national extravagance" and must be used to pay down the national debt. John Tyler (1841-1845), who succeeded William Harrison after only one month in office, even when facing America's first nation-wide economic depression, rallied against deficit spending and the incurrence of concurrent debt. James Polk (1845-1849) stressed that debt eradication would enhance America's status in the international community (Schultz and Caine 1973).

As the buildup to the Civil War approached, another factor was added into the budget philosophy and practices of Zachary Taylor (1849-1850), Millard Fillmore (1850-1853), Franklin Pierce (1853-1857), and James Buchanan (1857-1861). In addition to balancing the annual budget and paying down the federal debt, these presidents condemned any and all attempts on the part of the central government to redistribute the nation's wealth. Buchanan encapsulated the eschewal of this nascent use of government monies for purposes of welfare when stating (Myers 1970, p. 87):

> "Melancholy is the condition of the people whose government can be sustained only be a system which periodically transfers large amounts from the labors of the many to the coffers of the few".

These presidents pledged to utilize any budget surpluses to retire the national debt and to reduce tax levels to that of spending. Buchanan took a step further by authorizing only those expenditure increases explicitly allowed in the Constitution such as an enlarging the size of the navy and enhancing coastal defenses.

The Civil War produced a hiatus on the presidential consensus of balanced budgets and debt reduction, although the former was achieved during Lincoln's term in office by practicing what Washington did during the American revolution, i.e., printing currency known as "greenbacks" due to the ink color that was used in order to cover war expenditures in excess of collected taxes. President Lincoln (1861-1865) justified the accumulation of government debt when stating that "...citizens cannot be much opposed by a debt which they owe to themselves". President Andrew Johnson (1865-1869) inherited a $2.5 billion debt which was an astronomical sum at that time (although pales in comparison to today's national debt referenced in part one above in both nominal and real terms). And pursuant to expenditures during his years in office for the Reconstruction Plan totaling an amount almost equal to the summated budgets from Washington to Buchanan (1789-1861), both balancing the budget and paying down the public debt became problematic (Dewey 1939).

Kimmel (1959) noted that President Ulysses S. Grant (1869-1877) was the first executive to endear the methodology of supply side economics *a la* President Reagan a century later with his budget and debt policies. He succeeded in cutting taxes, both internal excise ones and the much maligned and despised custom's duties, which actually raised revenues while reining in expenditures. In turn, the public debt virtually disappeared by the time Rutherford Hayes (1877-1881) took over the presidency. The philosophy and practice of annually balancing budgets in tandem with maintaining a low national debt level once again took hold of the administration. Hayes not only wanted to pay down the debt but to also broaden its dispersion among citizens. Chester Arthur (1881-1885), replacing James Garfield who was assassinated after six months in office, did achieve a balanced budget during three of his four years as president with little increase in debt obligations.

Grover Cleveland, as president twice (1885-1889 and 1893-1897), and Benjamin Harrison (1889-1893), who served between his terms, followed the path to which Hayes and Arthur had returned. In fact more than 100 years of government budgetary operations and debt practice can be summarized with a quote from Cleveland delivered during his first administration in 1889 (Kimmel 1959, p. 71):

> "The public Treasury, which should exist only as a conduit conveying the people's tribute to its legitimate objects of expenditure, becomes a hoarding place for money needlessly withdrawn from trade and the people's use, thus crippling our national energies..."

Thus as America entered the twentieth century, the fiscal policy espoused by the executive branch was that a national debt would be a burden on the economy which must be liquidated as quickly as possible; that government should operate on a pay-as-you-go system of balanced budgets; and that any program which withdrew capital from the people and transferred it to the central government would imperil national prosperity (Myers 1970).

However, after the assassination of William McKinley (1897-1901) the administration took on a somewhat different budget philosophy. Peckman (1971) points out that with the start of the Progressive Era, Teddy Roosevelt (1901-1909) made an abrupt change in the federal government's budget and debt policies. Peacock and Wiseman (1961) state that the Roosevelt administration, in order to justify financing the government programs stated in this "new" era of social awareness, supported the opinion that since the national debt was owed to the country's citizens it cannot be inherently evil "but is to be judged on the nation's ability to pay". The notion developed that the size of the deficit and the debt is of minimal importance, whereas the paramount issue is the government's, and thus the people's, return on the expenditure in the form of social programs. Not surprisingly both the deficit and the debt grew during Roosevelt's term, and the groundwork for a new source of revenue, the income tax, was laid.

While William Taft (1909-1913) attempted to return to the previous policy of balanced budgets evident in the pre-Roosevelt period, his successor, Woodrow Wilson (1913-1921), eyeing the developments in Europe into which America was inevitably drawn, stated (Kimmel 1959, pp. 87-8):

> "[The American people] are not jealous of the amount their Government costs if they are sure that they get what they need and desire for the outlay, that the money is being spent for objects of which they approve, and that *it is being applied with good business sense and management*" (Italics added).

Nevertheless Schultz and Caine (1973) stress that Wilson along with McKinley and Taft before him spoke in opposition to budget deficits. However the financial exigencies of WWI and the support with which the U.S. government provided war torn Europe after 1918 went against the prospect of a balanced budget and produced a rising national level of debt.

A strong opposing reaction to debt and a rising demand for budget balancing returned with a vengeance during the William Harding (1921-1923) and Calvin Coolidge(1923-1929) administrations. The Liberty Loan Act of 1919 established an earmarked fund to be used solely to reduce the debt, which was cut by one-third from $24 billion to $16 billion by the time of the 1929 stock market crash (Shoup 1969). As predicted above by Wilson, during the decade of the 1920s the consensus was that government finances should function like those of a business. Recalling what led into the Great War, Coolidge further argued that a combination of low taxes with a paucity of government spending would provide Americans with "that contentment and peace of mind which will go far to render them immune from any envious inclination toward other countries" (Shonfield 1965, p.112).

The Great Depression generated the collapse in GNP by almost 40% between 1929 and 1933 and a concurrent increase in unemployment to 25% of the labor force in the latter year. Herbert Hoover (1929-1933), while initially espousing a belief in budget balancing and minimal debt and a desire to run Washington like an efficient business, saw budget deficits inexorably rise due mostly to a collapsing tax revenue base. This calamity marked the end of the primacy of reducing the national debt and balancing the budget in the watershed that Wilensky (1975) called "the creative use of expenditures". The immediate result was the application of Keynesian economics followed by the steady and unwavering move to today's level of massive deficit spending and colossal public debt via the current bailout schemes under President Obama.

Conclusion

Boaz (2009) states that the Obama bailout plan places American capitalism and possibly personal freedoms under assault. America is facing a crisis caused primarily by the long standing easy monetary policies of the Federal Reserve Bank, a corporate tax system which imposes one of the highest marginal rates in the world on businesses, and the unsound mortgage lending practices of Fannie Mae and Freddie Mac resulting from the Community Reinvestment Act enacted by Congress in 1977. The response in Washington has been to blame the free enterprise system of capitalism rather than the true culprit, the

before noted governmental policies. In addition, Halcoussis et al (2009) in a recent paper directly correlates the rise in Obama's electoral prospects during the 2008 Presidential campaign and his move into the White House in 2009 with the abrupt decline in all U.S. stock market indices. The authors clarify which way the cause and effect nexus runs when stating (p. 329):

> "Our findings call into question the standard argument that economic and financial distress was the primary reason for Obama's success at the polls. We suggest, to the contrary, that Obama's political gains were a significant contributor to the collapse of stock prices..."

Furthermore the actual and potential bailout expenditures have generated a movement among various central banks to end the dollar's current position as the world's vehicle currency. This is being led by China and being followed by Brazil, Russia, and even India, collectively known as the BRIC nations (Humpage 2009). The massive 2009 deficit in the federal budget coupled with the projected trillion dollars per year ones over the next decade has led Mr. Zhou Xiaochuan, governor of the People's Bank of China (PBOC), to raise concern with the consequence of the inevitable massive printing of dollars. Much to the chagrin of the U.S. treasury, he proposed at the July 8, 2009 G8 meeting in L'Aquila, Italy that the greenback should be replaced with a new global currency, the IMF's Special Drawing Right (SDR). Created by that organization in 1969, its value is based upon a weighted average of the U.S. dollar, the euro, the yen and the pound sterling. Under Zhou's plan the issuance of SDRs would be markedly increased so as to supersede and eventually fully replace the American currency in foreign reserve holdings and in international financial transactions and settlements. And the basket of currencies underpinning the SDR's value would be expanded to include the Chinese yuan, the Indian rupee, the Brazilian real, and eventually even the Russian ruble. In anticipation of the G8 summit on July 5, 2009 the Russian central bank announced that it would begin to reduce its U.S. money holdings citing the current dollar system as being "flawed" (*Economist,* June 20, 2009 & July 11, 2009). Merkel (2009) points out that the dollar has been steadily and inexorably losing global share to the euro over the last ten years. At the launch of the euro in 2001 72% of the world's foreign reserves were held in dollar denominated instruments. By the end of 2008 this percentage fell to 66%. Over the same time the euro's hold on international finance rose from 18% to 25%. The IMF (2009) reported that by mid 2009 the figures were 64% and 27% respectively for the dollar and the euro. Marsh (2009) sums up the cause of these changes when stating (p.3):

> "The rise in the Euro's popularity among investors and banks reflects far less Europe's innate financial attractiveness, *far more the profligacy of U.S. politicians* presiding over a steady decline in the dollar, progressively weighed down by America's deteriorating finances..." (italics added).

The Obama bailout spending may well be the catalyst that pushes the dollar off its global pedestal and ushers in the euro as its replacement.

Further concern over the dollar's future hegemonic status came in June 2009 when rating agencies in Brazil downgraded U.S. Treasury bonds, bills, and notes for the first time anywhere in U.S. debt history. The reason cited was the likelihood of rising inflation in America *a la'* the late 1970s and early 1980s due to the infusion of new money from the stimulus into the economy in tandem with the cumulative $19 trillion U.S. federal debt that the projected deficits of one trillion dollars per annum were going to produce. All this would place downward pressure on both the value of outstanding treasuries held around the world and the greenback's exchange rate value, the latter in turn reducing the value of financial instruments listed in dollar figures. The possibility of other nations following suit is evident especially in light of the Russian central bank's reduction of dollar holdings noted above (Zacharias et al 2009).

The Obama debt surge will not be temporary. It is estimated that by 2019 close to one-third of the U.S. GDP will be under Washington's domination if the spending trend continues. And a large swath of the economy's "commanding heights" will be directly controlled by Congress and the President due to its being "too big to fail"; AIG and GM come to mind as a beginning point. As an exercise in counter-factual recent events envision the outcome if Washington would have bailed out Enron and World Com.

> "The economic crisis facing this country is an opportunity for us [the federal government]. After all, *you never want a crisis to go to waste.* And this crisis provides the opportunity for us to do things you could not do before" (italics added).

In his classic work "A Study in Public Finance" Pigou (1962) succinctly sums up the dilemma that America will face when all the stimulus money eventually "hits the street" (p.17):

> "It has to be remembered, however, that, after a currency crisis, there will be outstanding, not only a large mass of contracts between individuals, but also a large mass of debts owing to individuals by the government. Since it may well be that the government would be greatly embarrassed in balancing its budget if these debts – or the interest upon them – were to be paid in money of the value that ruled when they were incurred; it is not to be expected that any law for revising contracts will write-up debts from the government in a ratio equivalent to the depreciation [in money's purchasing power value] that has occurred; and it is difficult to defend a policy which would write-up debts due from private persons much further than debts due from the government".

Given the massive increase in federal debt the Obama plan is producing, Pigou's observation is quite prescient and one that Washington may well want to address.

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Schiereck and Zeidler (2008) analyze risk changes after cross-border bank mergers and the effects of revenue diversification and relative risk. Examining 264 financial institutions from 33 countries they find a significant effect of revenue diversification on bank risk. But contradicting primary intuition, they observe that acquiring banks' firm-specific as well as total return volatility increases for those acquirers. They motivate their findings in that increased costs for managing the post merger integration and monitoring concurrent diversification overcompensate potential benefits.

Motives for M&A

Concerning the case of vertical or lateral M&A transactions, general motives for these transactions build on risk reduction through corporate diversification. On first sight, a product-market diversification leads to an increased number of not perfectly correlated cash flows. The likelihood of single business issues putting the firm as a whole at risk is decreased. There are studies that support the notion of reduced cash-flow variability caused by a diversification strategy similar to investors building efficient portfolios (e.g. Amit and Wernerfelt (1990); Amit and Livnat (1988a), (1988b)). Contrary, evidence has been provided that unrelated diversification leads to increased firm risk (Lubatkin and O'Neill (1987); Lubatkin and Chatterjee (1994)). The managerial difficulty caused by added complexity to the overall firm overcompensates the risk reduction through diversification. Additional explanation is given by e.g. Amihud and Lev (1981) and Scharfstein (1998). Using the investors view as an analogy, diversification strategies based on plain risk-reduction motives have often shown to be value diminishing because stockholders most efficiently reduce risk themselves by holding diversified portfolios. Agency theory suggests that lateral diversification in particular may result from the separation of ownership and control affecting managers' incentives negatively (Jensen and Meckling 1976, Jensen 2005). Unrelated mergers could be pursued by management if it has not been closely monitored by e.g. large block stockholders. In order to achieve reduced employment risk managers diversify and thus obtain private benefits at the expense of shareholders.

Construction industry specific motives for M&A are discussed along the three transaction directions. Delany and Wamuziri (2004) argue that plain horizontal mergers build on an increased reputation through size by signaling higher technical competencies and a more solid capital base empowering advance financing of large-scale projects. Cross-border horizontal transactions additionally reduce impact of national economical downswings. An extension of the value chain through vertical acquisition as Flanagan and Norman (1993) state aims at a reduction of the construction industry's latent high risk level caused by firms' unique dependency on success of single large-scale while limited in time projects. E. g. project development or real estate management are based on long-term contracts with continuous income streams and have thus more moderate risk structures at lower absolute levels. Lateral transactions are furthermore diversifying in that risk characteristics may be totally different.

Expectations on Risk Behavior

Total stock return risk reflects a company's full exposure to all internal risks (e.g. management quality, financial leverage, or client portfolio structure) and all external risks (e.g. economical development, competition and industry innovation). This paper concentrates on the diversification effect on risk, namely the bankruptcy risk that is imposed by single large scale construction projects. Diversification across a larger project base and various clients implies a descent in this immanent risk. But, being only one out of various risks affecting total risk behavior it is doubtful whether the effect is more than marginal if not non-observable. Systematic risk (reflected by beta) describes a company's relative behavior to a chosen index. The preferred local market indices absorb external risks that are due to country specifics and global economical developments. Consequently, systematic risk may be seen as a fraction of total risk incorporating fewer sub-risks. The relative weight of the focused company specific risk should be higher in systematic compared to total risk. Idiosyncratic risk is the counterpart of systematic risk. Its explanatory power depends inversely on the degree of a regression's R^2. Hence, idiosyncratic risk contains all sub-risks that do not show any scalability on the market's behavior. The focus risk caused by undiversified project portfolios is not industry specific but its magnitude in the construction industry is eminent compared to other industries. Consequently, we expect both systematic and idiosyncratic risk to be significantly negatively affected.

Concerning the sub-sampling along transaction directions we expect by minimum a negative shift in systematic risk for horizontal and vertical mergers. For lateral M&A we are skeptical whether diversification benefits outweigh increased integration and monitoring costs. Regarding transaction volume and relative size we are convinced that both measures, when increasing show a considerable magnifying effect in systematic risk reduction.

Data and Methodology

Our sample of M&A transactions comes from Thomson One SDC Platinum Database. We consider world-wide transactions (a) with a deal value of no smaller than US-$10m, (b) which were announced between January 1, 1988 and

December 31, 2007, (c) where over 50% of the bidding firm was acquired, and (d) where acquirers are strictly classified as construction businesses (SIC-code 1500-1799). Furthermore, we restrict our sample to (e) acquirers that have not undertaken a takeover in the one year period surrounding the announcement date, (f) have shown continuous trading activity from two years before to two years after the event and (g) that were within that time-frame not classified as penny stocks. Our return data for the acquiring construction firms as well as the home indices comes from Thomson Financial Datastream. The final sample consists of 120 international transactions from 26 countries. The decision to prefer local market indices over a global (industry) index or local industry indices are twofold. First, we prefer to control for cross-regional imbalances in economical cycles which eliminates a global index. Applying contrary methodology could result in beta biases that were strongly due to regional aspects. Second, measuring systematic risk (beta) to an local industry index that is basically composed by the focus firms is not value adding. Beta would be expected to be equal to 1 at all times.

Our risk analysis approach is threefold. Next to the beta concept we also shed light on construction firms' total and idiosyncratic risk. This implies that we additionally observe total volatility of construction firms' traded equity and the volatility of the error terms resulting from regression analyses. Whereas well diversified investors are mainly interested in stocks' behavior compared to respective markets, a critical view on total risk offers more insight with respect to default risk and bankruptcy costs focused by borrowers (Stiroh 2006). Similarly, idiosyncratic risk reflects the uncertainty component where single stocks' behavior is unrelated to the market and highlights the respective characteristics and magnitude.

Researchers have though identified beta as primary risk measure. Beta is derived from corporate stock behavior and the concept is also widely used by practitioners. According to Sharpe (1964) and Lintner (1965) beta symbolizes a stock's systematic risk. Beta was promoted by the advancing capital asset pricing model (CAPM) which assumes it as being stable over time. Beta stability though has been intensively questioned and challenged by financial economists such as Fabozzi and Francis (1978), Sunder (1980), Bos and Newbold (1984), Collins et al. (1987) and Jagannathan and Wang (1996). In recent years various modeling techniques have been developed that allow for time-varying behavior of beta. Consequently, we will apply a risk modeling technique that allows for time-varying observation of beta next to a conventional OLS regression model. The generalized autoregressive conditional heteroscedasticity (GARCH) approach by Engle (1982) and Bollerslev (1986), (1990) will be applied. All three risk parameters are first modeled and observed through a 250 day rolling-window approach (from two months [42 trading days] before up to 1 year and 2 months [292 trading days] after the actual M&A announcement) applying standard volatility and OLS regression methods. In a second step, the GARCH/M-GARCH approaches model the comparable values for total and systematic risk measures.

The basic assumption of the CAPM is a constant market risk. The excess-return market model with constant coefficients allows the determination of an asset's unconditional beta using the OLS approach:

$$R_{it} = \alpha_i + \beta_i R_{0t} + \varepsilon_{it}, \quad \epsilon_{it} \sim (0, \sigma_i^2), \tag{1}$$

with

$$\beta_i^* = \frac{Cov(R_0, R_i)}{Var(R_0)}, \tag{2}$$

where R_{0t} denotes the excess return of the market portfolio and R_{it} denotes the excess return to sector i for $i = 1,\ldots, I$, each for period $t = 1,\ldots, T$. The error terms ε_{it} are assumed to have zero mean, constant variance σ_i^2 and to be independently and identically distributed (IID).

Whereas CAPM assumes returns being IDD, empirical research in finance has found signs for many returns in financial markets that this actually does not hold true. Indication for autocorrelation and return patterns that point to volatility clusters are found regularly and are basis for criticism on the assumption of independence and identical return distribution on global stock exchanges. The generalized autoregressive conditional heteroscedasticity (GARCH) approach accounts for these less strict assumptions on returns' distribution. In a multistep sequence GARCH (1,1) first determines a volatility measure based on a long-run average variance rate V_L, the squared previous day return u_{n-1} and the squared previous day standard deviation σ_{n-1}.

$$\sigma_n^2 = \gamma V_L + \eta u_{n-1}^2 + \phi \sigma_{n-1}^2 \tag{3}$$

Obtaining a beta estimate as next step is done by applying the Multivariate GARCH (M-GARCH) model that observes the actual beta as the product of a constant correlation coefficient between stock and market and the quotient of the stock's time-variant standard deviation by the market's time-variant standard deviation.

$$\beta_{it} = \frac{\rho_{im}\sigma_{it}}{\sigma_{mt}} \tag{4}$$

Idiosyncratic risk cannot be modeled via GARCH since the respective error terms are simply additive output of the OLS regression. Consequently, they reflect the same 250-day rolling window approach, whereby their changing standard deviation along the observation period provides a view on idiosyncratic risk changes.

Results

Full sample total risk measures for the time periods before and after the M&A transaction are given in Table 1. Total risk measures observed by plain standard deviation (SD) and GARCH are not strictly equivalent but do show comparable

increasing behavior along the observation period. T-values support first intuition that total risk increases significantly after the M&A transaction. We recall that no substantial expectations on total risk behavior were derived. The observed increase in total risk is not explicable with the expected negative impact from diversification. This leads to the conclusion that the rise in total risk must have been induced by some other than our focus risk which is in line with the respective presumption.

Table 1: Risk behavior across risk classes (n=120)

Total Risk	Standard deviation (SD) in %	SD	GARCH
[days to event]	[-42]	1.71%	2.37%
	[+208]	2.00%	2.49%
	[+292]	2.02%	2.66%
	SD change in bp		
	[-42] - [+208]	29*	12
	[+208] - [+292]	2	16*
	T-Test		
	[-42] - [+208]	1.79	1.03
	[+208] - [+292]	0.19	1.65
Systematic Risk	Beta (β)	OLS	M-GARCH
	[-42]	0.87	1.01
	[+208]	0.95	0.91
	[+292]	0.93	0.80
	Beta (β) change		
	[-42] - [+208]	0.09	-0.10
	[+208] - [+292]	-0.03	-0.11*
	T-Test		
	[-42] - [+208]	1.32	-0.88
	[+208] - [+292]	-0.42	-1.82

* significant at the 10% level, * significant at the 5% level, *** significant at the 1% level.

Systematic risk behavior, represented by changes in the beta factor is also given in table 1. OLS and M-GARCH show dissimilar developments of their beta factors subsequent to M&A. Whereas the OLS beta increases the M-GARCH beta decreases over the observation period. Checking for T-statistics, scholars find evidence that these changes are significant only onesided. Just for the decreasing M-GARCH beta a supporting t-value at a 10% confidence level is obtained. Summing up, we may not record that the beta estimates of the two competing models are equivalent. Most probably the true but unobservable beta incorporates some characteristics of both methodologies. But, Mergner and Bulla (2008) concluded in their academic work that sector returns could always better be described by truly time-varying betas than in connection with standard OLS. Following their findings and valuing the M-GARCH beta estimates higher than the OLS beta estimates we decide to state that beta significantly decreases one year after the M&A. Reflecting this finding on the previously derived expectations on systematic risk behavior we see congruency. The argument that risk reduction through diversification weighs higher in systematic risk than total risk seems reasonable. Nevertheless, we have to acknowledge that only one out of two risk measurement models supports our theoretical implications and this is at a rather low confidence level.

Idiosyncratic risk behaves comparably to total risk. But, idiosyncratic risk changes for total sample are not statistically significant and are thus left aside in the respective table. This observation somehow contradicts the authors' derived expectations on idiosyncratic risk behavior since we anticipated similar behavior as for systematic risk. The results for our total sample must imply that the decreasing sub-risk due to project portfolio diversification is more reflected in systematic risk than in idiosyncratic risk.

Determinants of Risk Behavior

Our sub-sampling methodology consists in dividing total sample along parameter specifications if of nominal scale (e.g. transaction direction) or cut total sample into equally sized tertiaries if variables are metric (e.g. transaction volume). Since we were able to observe various risk changes for total sample we now scrutinize whether relevant sub-samples provide deeper insights into these risk shifts. We test for risk shifts within risk classes along the observation period and we test for significant differences in risk levels between the sub-samples.

First, we divide total sample along the performed transaction directions (horizontal, vertical and lateral) to find evidence for diverging risk behavior. For the vertical sub-sample no significant risk changes are observed. For the horizontal and lateral sub-samples though significant shifts across all risk classes are recorded. Concerning horizontally growing acquirers the M-GARCH beta returns a significant descent. For the lateral M&A transaction plain SD and

GARCH detect a significant rise in total risk within a year of the M&A. GARCH estimates even a significant value for a consecutive increase in total risk 14 months after the M&A transactions. Furthermore, lateral M&A results in a rise of idiosyncratic risk. Table 2 provides selected figures to risk changes for the three transaction directions.

Table 2: Risk behavior by "transaction direction"

	Horizontal (n=61)		**Vertical** (n=32)		**Lateral** (n=27)	
Total Risk	SD	GARCH	SD	GARCH	SD	GARCH
SD in %						
[-42]	1.80%	2.48%	1.95%	2.45%	1.47%	2.17%
[+208]	1.95%	2.49%	1.99%	2.32%	2.09%	2.56%
[+292]	1.98%	2.58%	1.97%	2.32%	2.15%	2.97%
SD change in bp						
[-42] - [+208]	16	2	4	-13	62***	39**
[+208] - [+292]	3	8	-2	0	6	42***
Systematic Risk	OLS	M-GAR.	OLS	M-GAR.	OLS	M-GAR.
Beta (β)						
[-42]	0.82	1.00	1.10	1.08	0.85	1.00
[+208]	0.94	0.91	1.07	0.95	0.94	0.91
[+292]	0.87	0.80	1.02	0.88	1.00	0.77
Beta (β) change						
[-42] - [+208]	0.12	-0.09	-0.02	-0.13	0.08	-0.09
[+208] - [+292]	-0.07	-0.11*	-0.06	-0.06	0.06	-0.14

* significant at the 10% level, * significant at the 5% level, *** significant at the 1% level.

Our expectations on risk behavior for horizontal and lateral M&A transactions have been confirmed. Pursuing a client base diversification while staying focused on ordinary construction business (horizontal M&A) leads to the expected decrease in systematic risk. The case of lateral M&A obviously suffers from increased risk implying that diversification must have been overcompensated by negative effects. Vertical M&A as intermediate diversification strategy appears not to be superior to horizontal M&A in terms of risk dynamics.

The second and third sub-sampling approaches concern M&A size measures. Referring to the introduction of this study we formulated hypothesis 3 where we expected M&A size measures to play a significant role in magnifying risk shifts following M&A transactions in the construction industry. These size measures are transaction volume and relative size (the quotient of transaction volume and acquirer market value at the time of M&A announcement).

Total risk shows a positive shift for transactions with high transaction volumes (SD and GARCH at 10% confidence level). Systematic risk measured by OLS rises significantly at the 10% confidence level for low and medium sized transactions which is not supported by M-GARCH beta measures. But, M-GARCH beta measures a descent for the high transaction volume sub-sample which is statistically significant at the 5% confidence level. This M-GARCH beta descent is equivalently observed for the high relative size sub-sample. Here, beta decreases even stronger and on a slightly higher significance level. Also, these observations support our hypothesis and expectations on the effect of M&A size measures on risk behavior. Rising transaction volume and increased relative size lead to a magnification of total risk increase and systematic risk reduction.

Robustness Checks and Multivariate Analysis

An univariate analysis of time period effects on risk behavior suggests that a long-term increase in total risk may be predominant and might have somehow biased our results. The time-effect may thus serve as a partial explanation why a rise in total risk was observable, even though, it contradicts the risk reduction argument due to diversification. Local market indices should absorb such global developments. Thus, return beta estimates contrary to total risk behavior, are free of such biases. An observable European total risk increase corresponds to the time dependant rise in total risk. The fact that the North American market shows generally higher risk levels and the European market seems to approach similarity might be an argument why we observe a general total risk increase in time. However, European total risk increase acts as an additional risk driver. It is absorbed by local market indices resulting in unbiased beta estimates but directly influences total risk measures.

In order to gain further insights on potential dependencies of risk behavior on M&A variables such as transaction direction, transaction size, and the robustness check's variables time and region a cross-sectional regression is performed.

In total, 8 variables are included in the regression on standardized relative changes in acquirer total risk, systematic risk (beta) and idiosyncratic risk. Equation (5) presents the respective model:

$$Risk\_type_i = \alpha_0 + \gamma_1 * Horizontal + \gamma_2 * Lateral + \gamma_3 * Transaction\ value + \gamma_4 * Relative\ Size + \gamma_5 * Europe + \gamma_6 * North\ America + \gamma_7 * "1996 - 2001" + \gamma_8 * "2002 - 2007" \quad (5)$$

Regarding univariate analyses, horizontal transactions showed to have a negative effect on systematic risk while lateral diversification returned evidence for increasing total risk. Consequently, both diversification strategies are incorporated as individual dummy variables to again test their risk affecting character assuming the value "1" if true and "0" if not true. Transaction value and relative size showed comparably magnifying effects on risk shifts when increasing. Due to their metric scale they can be directly applied to the following analysis. Regarding the first robustness check's variable time we found indication that a long term increase in total risk might persist. Thus, we will test whether the second (1996-2001) or the third economical period (2002-2007) can be certified a significant effect on positive total risk shifts through the multivariate regression. Finally, region will be represented by the two dummy variables Europe and North America each being able to carry either the value "0" if not true or "1" if true.

Overall, the multivariate results differ from the univariate results in that hardly any of our previous findings are directly supported. On a second view though, risk determinant characteristics are in line with our previous findings. Regarding Total Risk (SD) changes only the variables representing horizontal transaction and relative size return influencing factors (significant at the 10% level). Whereas horizontal diversification leads to decreasing total risk within a year of M&A announcement, increasing relative size drives a total risk increase in the second year after the same event. The negative effect of horizontal diversification on total risk has not been identified before but fits well our general reasoning. Sub-sampling by relative size showed some insignificant indication that it leads to decreasing total risk which is now supported by the multivariate analysis.

Systematic risk (OLS) descent is driven by the time periods "1996-2001" and "2002-2007" within a year of M&A announcement. Contrary, North America shows a positive effect on OLS beta during the second year following the M&A. All three determinants' significance is at the 5% confidence level. A close look at sub-sampled time periods two and three and their effects on risk also shows some decreasing tendencies on systematic risk (M-GARCH) next to the highlighted increases in total risk (SD and GARCH) for the third period.

Comparing the overall multivariate results to our univariate results we do not identify any exactly congruent findings. But, there are no contradictions either. As expected, manifold effects have to be taken into account modeling acquirer risk behavior. Performing research from multiple angles likely leads to various impressions. In sum though, all impressions add up to one "big picture" for M&A induced risk behavior in the construction industry.

Conclusions

The results show for the total sample an increase in total risk and a decrease in systematic risk that could be observed in the 14 months following the event announcement. Interpreting these findings, we state that empirical results support our theoretical expectations partially. The descent in beta underlines the presumption that project portfolio diversification as result of external growth through M&A reduces acquirer risk. Sub-sampling along transaction direction depicts that horizontal M&A is the main driver behind this decrease in systematic risk. Furthermore, sub-sampling along M&A size measures supports the intuition that increasing transaction volume and relative size magnify the systematic risk reduction. A multivariate regression returns further evidence that also time period effects (1996 to 2007) supports this decreasing tendency.

The rise in total risk comes rather unexpected. Sub-sampling along transaction direction identifies lateral transaction direction as a main driver behind this increase. Most probably high integration and monitoring costs overcompensate potential benefits though diversification. The analysis of M&A size measures by the respective sub-sampling indicates that increasing transaction volume indeed magnifies a rise in total risk. The multivariate analysis finds indication that the same holds true for increasing relative transaction size. Additionally, it identifies horizontal diversification as a total risk determinant affecting this risk type negatively, even though its impact is obviously overcompensated.

Summing up, M&A in the construction industry and its effect on acquirer risk represents a worthwhile research topic that within the scope of this study returned several insights regarding risk shifts and their drivers. For future research the authors of this paper recommend a further drill down within the very same topic and the application of the theoretical and technical concepts to other industries. Even though, the risk modeling techniques applied showed largely similar behavior across risk types other competing approaches could be applied to further increase results' robustness. On the other hand there are risky industries such as the luxury and fashion business where high immanent idiosyncratic risk levels are of major concern (Königs 2009). Ambitious scholars of financial economics should devote some of their research time to this challenging topic.

Notes

[1] M&A related event studies with comprehensive industry focus find negative abnormal acquirer returns (Malatesta 1983, Limmack and McGregor 1995), as well as positive abnormal acquirer returns (Pettway and Yamada 1986, Fuller et al. 2002, Moeller, Schlingemann and Stulz 2005), or acquirer returns that are not significantly abnormal (Ruback 1983, Eckbo and Thorburn 2000).

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Fundamental Analysis of Value Stocks: Do Accounting Screens Work in a Down Market?

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Abstract

This paper appears to confirm prior research that suggests that fundamental analysis, based on publicly available financial statement information, can be used to distinguish future winners from future losers within a set of stocks with high book-to-market ratios. While the relationship between these financial signals and stock market returns has weakened slightly over time, absolute and market-adjusted returns among value stocks continue to be dramatically larger for those firms with a high number of positive financial signals. Further, while this relationship is generally strongest among firms with small market capitalizations, it also exists for mid-size and large firms.

Introduction and Literature Review

Value Stock Returns: Market Efficiency or Inefficiency?

A significant body of previous research, dating back many years, has found that as a group, "value stocks" (i.e., firms with above-average book-to-market ratios) tend to outperform "growth stocks" or "glamour stocks" (i.e., firms with below-average book-to-market ratios). Findings along these lines date back to at least Rosenberg, Reid, and Lanstein (1984), and of course the best-known paper with this finding is the Fama and French (1992) paper.

However, as noted in Piotroski's (2000) detailed review of the literature, scholars who agree on this bottom-line finding have reached widely disparate conclusions regarding the underlying reasons for this outcome. For instance, the aforementioned Fama and French (1992) paper treats the difference in the average returns of high- versus low-book-to-market firms as being consistent with the notion of market efficiency. In essence, a low book-to-market ratio is viewed as evidence that the firm's shares are deemed as risky; thus, the higher average returns on such shares is interpreted as rewarding investors for accepting that risk. Other papers with results that are broadly consistent with this theme include Penman (1991), Fama and French (1995), and Chen and Zhang (1998).

On the opposite side of this debate are those scholars who argue that the higher average returns on high book-to-market firms provide evidence of market inefficiency. Specifically, Lakonishok, Shleifer, and Vishny (1994) argue that high book-to-market ratios result from excessively negative market predictions of future performance, based on weak past performance. LaPorta et al. (1997) argue that these negative expectations tend to be followed by better-than-expected earnings results.

In comparing these and other papers, Piotroski (2000) argues that value stocks, more than growth stocks, are appropriate targets for fundamental analysis based on the firms' financial statements. This is because investors typically price growth stocks primarily on optimistic forecasts, rather than on financial information. Value stocks, on the other hand, are best evaluated through a careful analysis of the financial fundamentals. Thus, Piotroski (2000) argues that it is worthwhile to explore the relative attractiveness of value stocks, based on information that can be gleaned from the financial statements.

Fundamental Analysis of Value Stocks

While the Piotroski (2000) article forms the basis for this paper, Piotroski himself notes that his is far from the first effort to find stocks that the market has undervalued due to incorrect expectations. Prior efforts in this regard include articles by Frankel and Lee (1998), Dechow and Sloan (1997), and LaPorta (1996).

In particular, one may wish to identify promising value stocks based on fundamental analysis of these companies' financial performance. The positive market-adjusted returns of value stocks as a group occur despite the fact that a majority of individual value stocks actually underperform the market. Thus, there has been much interest in attempting to use financial statement analysis to distinguish those specific value stocks that are likely to form the high-performing minority from those value stocks that are likely to form the underperforming majority. If one can do so, then the already-positive market-adjusted returns that one would expect to receive from a value stock portfolio can be enhanced.

Successful efforts to use fundamental analysis to predict future market returns include those of Holthausen and Larcker (1992), Lev and Thiagarajan (1993), and Abarbanell and Bushee (1998).

The Piotroski Methodology

Since the present paper is intended primarily as an attempt to replicate Piotroski's (2000) results, we will describe his work in somewhat more detail than would ordinarily be included in a literature review. For each year from 1976 through 1996, Piotroski identifies those firms whose book-to-market ratios fall into the highest quintile. (To expand on his basic results, he performs a separate division of firms into terciles, based on market capitalization. His set of high book-to-market stocks is then subdivided based on whether these stocks fall into the high, medium, or low market capitalization tercile of the overall market.)

Each stock in the top book-to-market quintile is then evaluated on nine separate factors, which we itemize below, and receives a score of either 1 ("good") or 0 ("bad") on each of these factors. The firm's scores on these 9 factors are summed, resulting in an "F_score" ranging from 0 to 9, inclusive. Firms that have higher F_scores are hypothesized to be the most likely to produce positive market-adjusted returns over the ensuing year, and vice versa. Market-adjusted return realizations are evaluated separately for firms with each score from 0 through 9; in addition, results are evaluated for firms with scores of 0 and 1 combined ("Low Score") and firms with scores of 8 and 9 combined ("High Score").

The nine factors that Piotroski (2000) considers can be divided into indicators of the following: profitability; leverage, liquidity, and source of funds; and operating efficiency. In the area of profitability, four specific indicators are chosen. Scores of 1 are assigned for the following: ROA (net income before extraordinary items over beginning-of-year total assets) is positive; CFO (cash flow from operations over beginning-of-year total assets) is positive; ΔROA (current year's ROA minus prior year's ROA) is positive; and ACCRUAL (CFO minus ROA) is positive. Otherwise, scores of 0 are assigned for the respective factors.

In the area of leverage, liquidity, and source of funds, three specific indicators are chosen. Scores of 1 are assigned for the following: ΔLEVER (the most recent year's ratio of long-term debt to average total assets, minus the corresponding ratio for the prior year) is negative; ΔLIQUID (the most recent year's ratio of current assets to current liabilities minus the corresponding ratio for the prior year) is positive; and EQ_OFFER (an issuance of common equity within the past year) did not occur. Otherwise, scores of 0 are assigned.

In the area of operating efficiency, two specific indicators are chosen. Scores of 1 are assigned for the following: ΔMARGIN (current year's ratio of gross margin to total sales, minus the corresponding number for the prior year) is positive; and ΔTURN (current year's ratio of total sales to beginning-of-year total assets, minus the corresponding number for the prior year) is positive.

Summary of Key Findings by Piotroski

While Piotroski (2000) evaluates a wide variety of issues, for purposes of this paper we can describe his key findings rather succinctly. First, the portfolio of stocks comprising the top book-market quintile in any given year tend to have been issued by firms whose financial performance has been poor; profitability tends to have been both poor and declining, leverage tends to have increased, and liquidity tends to have decreased. (Piotroski 2000; Table 1, Panel A.) Over the ensuing one- and two-year periods, the portfolio as a whole will out-perform the market; but, the majority of individual stocks within the portfolio will underperform the market. (Piotroski 2000; Table 1, Panel B.) Further, for the individual value stocks the market-adjusted return is more strongly (positively) correlated with the firm's overall F_Score than with any of the nine specific indicators comprising the F_Score. (Piotroski 2000; Table 2.)

The heart of Piotroski's (2000) findings may be found in his Table 3. This table demonstrates that market-adjusted returns over the ensuing year tend to improve rather steadily as the F_Score increases. Statistical tests indicate that the excess of the market-adjusted returns of the High Score firms over those of the Low Score firms is significant at the 1% level. The same is true when comparing the High Score firms to the value stock portfolio as a whole. The statistically significant superiority of the High Score firms to both the Low Score firms and the overall portfolio applies not only to the means, but also to the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles. Table 4 tests for size effects. It finds that the superiority of the mean and median market-adjusted returns of High Score firms is strongest among those value stocks falling into the smallest market-value tercile, somewhat smaller (but still highly significant) among those value stocks falling into the middle market-value tercile, and insignificant (or at best marginally significant) among those value stocks falling into the largest market-value tercile.

Are the Piotroski Results Replicable in Subsequent Periods?

With any model such as that of Piotroski (2000), it is important to avoid the assumption that the results found over a particular time period will persist into the future. First, *post hoc* analysis, even if based on plausible hypotheses, will inevitably find some "patterns" by random chance. If a given result that has been found to be statistically significant over one

time period can be demonstrated to be statistically significant over ensuing time periods, then obviously this will dramatically lessen concerns that the result in question was simply the "luck of the draw."

Second, even when a given result's statistical significance was not a matter of random chance, there is no guarantee that this result will be repeated in a future time period. With regard to potential market inefficiencies in particular, there is a logical case to be made for the notion that over time, "good models become bad." According to this argument, if some form of systematic mispricing of assets can be demonstrated to exist, then those individuals and institutions that possess the means to do so will exploit that mispricing. For instance, if risk-adjusted returns to a given subset of assets are demonstrated to be positive, then demand for these assets will increase, thereby making these assets more expensive and, in the process, lowering their future returns. The opposite will apply when a given subset of assets is demonstrated to have negative risk-adjusted returns. Over time, the risk-adjusted returns of both subsets of assets will move toward zero, and the decision rule in question will cease to produce excess returns.

With the Piotroski (2000) model in particular, another motivation for examining replicability in subsequent periods is the changes in the overall market environment during the time since Piotroski's sample period. There were, of course, a variety of financial market conditions during the Piotroski sample period, including the relatively flat market of the late 1970s, the mostly strong market of the 1980s, a dramatic interruption to that up-market in the form of the October 1987 crash, and the tremendous increase in overall market values during much of the 1990s. Nonetheless, one could make a strong argument that the overall sample period used by Piotroski was one of strong overall market returns, in which a model might well "discover" positive market-adjusted returns for the stocks of companies that have shown strong financial fundamentals but have relatively low market prices.

It would, however, be difficult to make the same argument regarding the time frame since the end of the Piotroski (2000) sample period. Since the Piotroski sample period, overall market results can reasonably be described as having demonstrated both an unusually high level of volatility, and poor overall returns. In particular, this time frame has seen two major downturns in market valuations, the first being after the burst of the "tech bubble" during the early part of the 2000-2009 decade, and the second being the financial meltdown of 2008. Thus, if the Piotroski findings were realized simply because the stock market climate, or the overall economic climate, were conducive to high returns on low-priced stocks with strong recent financial ratios, one would not necessarily expect similar results over the ensuing ten to twelve year period.

Thus, the goal of this paper is to examine whether the Piotroski (2000) results continue to hold when one pushes back the end date of the sample period as far as the methodology will allow based on currently available data, and also whether those results hold specifically to a period that falls exclusively after the Piotroski sample period.

Data and Methodology

Using financial statement data from Compustat, and market returns and market capitalization data from CRSP, the following methodology is employed for each fiscal year in the sample period (1976-2007). For each Year T, each firm's book-to-market ratio and total market value are calculated as of the fiscal year end date for Year T-1. (See Piotroski 2000, p. 11, footnote 8.) Firms are sorted into quintiles based on their book-to-market ratios, and are separately sorted into terciles based on size. Each firm that falls within the top book-to-market quintile is considered part of the sample, subject to availability of all necessary financial data and market return data.

For each such firm, each of the financial indicators described above is calculated for Year T, and the firm's F_Score for 2007 is calculated based on these indicators. Raw returns and market-adjusted returns are then calculated for the one-year period beginning in the fifth month after the end of Year T. An observation is dropped from the sample if the firm's fiscal year end date for Year T is not clear in Compustat, if the firm's fiscal year for Year T lasts for a period other than 12 months (due to a change in fiscal year end date from one year to the next), or if there is not sufficient information to calculate all variables of interest, including those that involve changes from Year T-1.

This process is repeated for each year from 1976-2007. (Had we attempted to cut extend the dates for the financial statement information through 2008, we would have stock return information only for a portion of firms, since the one-year return observation period runs for a one-year period beginning in the fifth month after the fiscal year end date.) All observations with a given F_Score, regardless of the specific year within the sample period, are initially grouped together for purposes of determining the distribution of returns for that F_Score. Then, the same tests are re-run after separating the sample period into two sub-samples. The first sub-sample is for fiscal years ending in 1976-1996, inclusive, so as to match the sample period of Piotroski (2000). The second sub-sample is for the subsequent period of 1997-2007, inclusive.

Results

While all of the tables from this paper are omitted for purposes of brevity, results of various tests are described below.

Descriptive Statistics for the Sample of High Book-to-Market Firms

A comparison of our entire sample period, the sub-period that corresponds to the period of Piotroski (2000), and the portion of our sample period that comes after the end of the period studied by Piotroski shows the following. First, in comparing the two sub-periods, the average size of our sample firms, whether measured by market value of equity or by book value of total assets, is three to four times as high during the second sub-period as during the first. Second, among the various "indicator" variables, there is a nearly equal division between those whose means and medians increased versus decreased from the first sub-period to the second. Third, however, the standard deviations increased for every "indicator" variable other than ΔLIQUID, indicating that financial ratios were more widely varied among value stocks during the latter sub-period. Fourth,. ΔLIQUID was also one of only two "indicator" variables for which the proportion of firms with positive signals increased over the second sub-period; ΔTURN was the other.

Usefulness of Financial Analysis in Predicting Forward Returns of Value Stocks

The primary purpose of this paper is to determine whether the ability of the Piotroski (2000) model to select value stocks based on fundamental financial signals has improved, diminished, or disappeared during the time since the end of the Piotroski sample period. While both absolute and market-adjusted returns were evaluated, our discussion will focus on the market-adjusted returns.

For the period as a whole there is a steady pattern of increasing average returns as the F_Score increases. The sole exception to this is that the returns fall when we move from the small (N=22) subsample of firms with an F_Score of 0 to the subsample of firms with an F_Score of 1. Otherwise, as the F_Score increases, the mean market-adjusted return likewise increases. Further, as noted in by Piotroski (2000), part of the strategy is to move the entire distribution of returns to the right. In our results – and again with the exception of increasing the F_Score from 0 to 1 – an increase in the F_Score leads to an improvement not only in the mean market-adjusted return, but also in the 10th, 25th, 50th, 75th, and 90th percentiles, and in the proportion of stocks showing a positive market-adjusted return. Tests for statistical significance show that mean market-adjusted returns for the High Score group (F_Scores of 8 or 9) are greater, at the 1% level, than both those for the overall sample, and those for the Low Score group (F_Scores of 0 or 1).

When we test the sub-sample that corresponds to the sample period used in Piotroski (2000), results are also strong. Mean returns and median returns steadily improve as the F_Score improves. With several of the percentile measures, there is a downward movement in returns as the F_Score improves from 1 to 2, and/or as the F_Score improves from 2 to 3. Otherwise, the overall pattern in which returns improve as F_Scores increase holds. And, as with the sample period as a whole, a comparison of mean market-adjusted returns for the High Score group to those of either the overall sample or the Low Score group is significant at the 1% level.

Most interestingly from our perspective, our results show that after the end of the Piotroski (2000) sample period, the overall pattern is only slightly weakened. Mean market-adjusted returns tend to rise with F_Scores, as do returns at the various percentiles. Returns do tend to weaken at most percentiles when going from an F_Score of 0 to 1, or from an F_Score of 8 to 9; the 90th percentile of returns is also lower at an F_Score of 2 than at an F_Score of 1. However, the sub-samples of firms having F_Scores of either 0 or 9 are quite small compared to the sample as a whole; and, the overall pattern of returns improving as F_Scores increase is abundantly clear. Statistical tests comparing the market-adjusted mean returns of the High Score group to those of either the overall sample or the Low Score group remain highly significant, with p-values well below 1%.

Thus, while the ability of the Piotroski (2000) model to discriminate between "winners" and "losers" among value stocks is slightly lower after the Piotroski sample period than it was during that period, the overall strength of the model remains quite impressive. If good models do, indeed, eventually become bad, it appears that the Piotroski model is doing so at a very slow pace.

Next, we turn to the question of whether the ability to discriminate among winners and losers within the set of value stocks is confined to the stocks of smaller companies. Piotroski (2000) found his strongest results among the subset of value stocks that were in the smallest market capitalization tercile of the overall stock market. (This subset included a majority of his overall sample, since most of the stocks that were in the top book-market quintile were also in the smallest market value tercile.) The results for those value stocks falling within the middle tercile of market values, while not as strong as those for

the smallest value stocks, were nonetheless easily significant at the 1% level. Results for the largest firms were generally not statistically significant, and at best were marginally significant.

To evaluate the size question, we perform our own tests of this issue for our sample. In short, our findings here are similar to Piotroski's in terms of relative strength among size groups – i.e., the results tend to be strongest among the smallest firms – but different from Piotroski's in that we consistently find statistically significant results even among the largest firms. For instance, in the tests for our overall sample period, both a comparison of the High Score group to the overall sample, and a comparison of the High Score group to the Low Score group, shows highly significant (p-value well under 1%) differences in the market-adjusted returns, with the test statistics steadily declining as we move from smaller firms to larger firms. In our tests of the 1976-1996 sub-period, this same pattern holds, although in some cases the declines in the test statistics moving from one size group to the next are quite small.

In our tests for the 1997-2007 sub-period, the same pattern holds again in comparing the High Score firms to the entire sample. However, over this period the size pattern is slightly different when we compare the High Score firms to the Low Score firms. The test statistic does decline somewhat when moving from the small firms to the midsize firms; however, the largest test statistic in this set of tests is actually for the large firms. However, as with all of the other statistical tests performed here, the result is easily significant at the 1% level in all three size groups.

Taking these results as a whole, we continue to see a general pattern in which both the mean and the median market-adjusted returns improve as F_Scores increase. However, there are a number of exceptions to this pattern. Most, but not all, of these exceptions occur at the extremes; for instance, when the F_Score moves from 0 to 1, 1 to 2, or 8 to 9. Thus, while market-adjusted returns clearly are an increasing function of the F_Score, the relationship is not purely monotonic.

Conclusion and Future Research Direction

Our results tend to indicate that the financial statement variables identified by Piotriski (2000) continue to be effective in distinguishing between future winners and future losers among those firms with high book-to-market ratios. Although the statistical significance of this relationship has arguably weakened over time, significance levels remain extremely strong. Further, the differences appear to be not only statistically significant, but also economically significant. We are not dealing here simply with high test statistics; the actual numerical differences in mean returns, median returns, and returns at various percentiles are quite large. Further, these large differences exist not only in comparisons of High Score firms to Low Score firms, but also in comparisons of High Score firms to the overall sample of high book-to-market stocks.

Further, while our results almost entirely confirm Piotroski's (2000) finding that return differences based on financial indicators decline with increases in firm size, we (unlike Piotroski) consistently find that these differences are highly statistically significant even among larger firms.

These findings would seem to be consistent with the conclusions of Lakonishok, Shleifer, and Vishny (1994) and of LaPorta et al. (1997) that there are potentially some market inefficiencies in the pricing of value stocks. In particular, it would appear that the market is slow to respond to the positive signals created when a company with a "beaten up" stock price produces a strong financial performance. Of course, our findings do not by any means rule out the notion that a portion of the higher returns of value stocks as a group is attributable to compensation for taking on risk. However, given the persistence over time of the difference in returns between value stocks with strong financial signals and those with weak financial signals, it does seem that in many cases these financial signals are not immediately impounded into stock prices.

Future work might focus, not just on overall periods of relative stock market weakness, but also on specific periods in which the market as a whole is experiencing a downturn. For instance, in addition to looking at the 1997-2007 subsample as a whole, it might well be informative to test the results from one year to the next. Obviously, the resulting reduction in sample size will weaken statistical power to some extent. However, given that we had over 8,400 observations in the 1997-2007 period, a year-by-year breakdown should retain sample sizes sufficiently large to produce statistically significant results for any truly meaningful differences.

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